THE IRON TRADE REVIEW

VOLUME XXIII. CLEVELAND, O., JULY 17, 1890. NUMBER 29.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY THE
CLEVELAND PRINTING AND PUBLISHING CO.,
Corner St. Clair and Wood Streets, Cleveland, O.

TERMS, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

ENTERED AT THE POSTOFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., JULY 17, 1890.

THE WEEK IN IRON CIRCLES.

General Features. The condition of the coke trade is generally indicative of the course of the iron business. Just now, shipments from the Connellsville region are rapidly falling off and production shows but slight improvement. The period of midsummer dullness is just getting under way and no immediate noticeable improvement can be expected. The promise of a large trade when the present period is over is bright. Furnaces in all sections of the country are preparing for the Fall run, and large orders for fuel will soon be placed. There is nothing gloomy in the situation and its condition may be fittingly described as healthy but inactive. Southern furnaces and rolling mills have just now to contend with the triple annoyance of very hot weather, scarcity of labor and railroad troubles. They have never before experienced so much difficulty in securing labor. As soon as the mills that have been shut down owing to the heat, and for making repairs, are ready to start up, there will be renewed activity. Some good sales were made in Louisville during the past week, but the iron was for the East, where the buying was more active on account of their delay in entering the market, owing to the unsettled condition of labor troubles. The amount of iron being offered is not large, as many furnaces in the South are shut down, owing to trouble with workmen in some instances and lack of ore or coke in others. Many consumers think that the passage of the silver bill will be an active factor in strengthening the market in August. Southern furnaces claim to be comfortably booked with orders and the trade well supplied, and from this view their positions are about balanced, though there are rumors current of some concessions being made in both coke and charcoal irons to affect sales. The usual midsummer dullness is noted in all branches of the iron trade at Cincinnati. This has emphasized also the extreme heat which has compelled partial stoppage of mills and foundries, and the labor troubles which have been a disturbing element in many localities. The freight handlers' strike at Cincinnati has caused much inconvenience to many consumers by interruption of traffic in pig iron North. There are few transactions of importance to note. The general outlook continues hopeful, and it is the feeling of both consumers and producers that the later months of the year will witness broad, healthy trading and probably improving prices. The week at Chicago has shown about the usual amount of midsummer July buying, inquiries and orders being for the most part of moderate size and for near-by deliveries. Lake Superior irons remain stationary and furnaces making these brands are firm as to changes in price. This being the season of lake navigation, heavy shipments are going forward to apply on contracts already booked. There is no change in the position of Southern irons in Chicago, these furnaces being firm and not disposed to make concessions. On the other hand consumers are buying in small lots only, in the belief that lower prices will shortly prevail. The past week has developed no new feature in the St. Louis market. Purchases for current requirements continue on a modest scale at previous prices; but consumers appear indifferent to offers for later deliveries, arguing that they will do better by waiting. Furnaces are indisposed to make concessions, and talk of higher prices in the early future. And so the problem comes again to the front: Who can hold out the longer—furnaces or consumers? Just now the former would seem to have somewhat the pull. Since our last report, there has been very little change in the Detroit market. What sales have been made are of Southern foundry iron grades. Lake Superior charcoal remains unchanged. Several small orders have been taken, but on account of very large sales last month there have been no deals of any magnitude during the week under review. The dullness which has now lasted for several weeks at Pittsburgh is regarded as only natural at this season of the year, when many of the mills have suspended operations to take stock, and the output of the others curtailed by the hot weather. The effect on prices is accordingly less than it would otherwise be, and while the tone of the market is rather weak, it can hardly be said to be quotably lower than heretofore. Business in pig iron for the past two weeks at Buffalo has been confined largely to charcoal iron, both of Lake Superior and Southern varieties. Comparatively little attention has been paid to foundry irons; the demand being light and the stocks at furnaces generally small.

Iron Ore. Despite the strenuous denials from certain interested quarters, the fact remains that some sales have been made of low grade ores, at a reduction from the price quoted all along. These sales are, however, confined almost altogether to the output of newly-developed properties, and in weak hands. That the standard ores are not in the least affected by this reduction is attested by the fact that fully nine-tenths of all standard ores are sold up, so that there is not the slightest occasion for cutting the price of the remaining fraction. Moreover, the sales agents are in no position to make a reduction, as such action would seriously embarrass the furnacemen who made their purchases early last Fall, and who would justly complain of discrimination. The ores above referred to as having found a market are non-Bessemers, ranging in iron from 55 to 59 per cent. From the Lake Superior country comes the report that, while generally speaking, labor is plentiful, there is in some districts a dearth of mining labor, brought about by purely local and unavoidable circumstances. During the past week the increased efforts on the part of the railway companies to increase their dock room, by way of rail shipments of ore, have been brought to naught by the action of the furnaces who in many instances decline to receive any more stock, all their storage facilities being fully occupied. Ore freights are stagnant, but there is a brisk trade going on in the coal line.

Pig Iron. The market is fully described in the statement that the sales are large and the profits are small—where, indeed, there is any profit left. With the beginning of the use of new ores a very peculiar state of affairs has manifested itself, which bids fair to wholly change the entire situation, at least as concerns the making of iron. It is admitted on every side that the continued making of pig material, at the ruling figure, seems a dead loss to the maker. It is no less a fact that the consumer doesn't care a picayune about the cost of manufacture, and that he is going to buy in the cheapest market, and without any pangs of conscience. Hence it is somewhat of a surprise to learn that there is a general disposition on the part of the furnacemen to go right on, making and selling pig iron, even at a loss. The reason for this change of front is found, partly, in the weakness of the smaller concerns who, to meet their ore payments, are compelled to turn their stock into cash, at any price, and partly, to the desire on the part of the strong furnaces, to retain their custom, also at any price. In the meantime iron is weaker, one sale of 17,000 tons of Bessemer being reported, for long future delivery, at $18.50. Foundry irons are moving lively, the price of a 5,000-ton lot for 90 days' delivery being $17, cash at the furnace.

Merchant Iron. The jobbers and handlers of mill products report an excellent business, especially in bar iron, which seems to command the market. Sheet iron is also much in quest and at fair prices.

OUR COAL AND ORE-HANDLING FACILITIES.

To those conversant with the present condition of Lake Erie ports, the paper signed by the leading dealers in Lake Superior iron ores, and printed in *The Iron Trade Review* of July 10, will not be surprising. When the ore dealers state that "the entire storage capacity of the [Lake Erie] docks is less than 50 per cent. of the total tonnage brought down during any season of navigation; and as nearly one million tons of last season's ore were left over in May 1, 1890, thus greatly encumbering the docks, they will soon be absolutely unable to receive a large proportion of the tonnage for the year 1890, which will exceed the actual product and sales of 1889," they outline a situation at once grave and significant. This state of affairs is one which calls for serious and immediate consideration, and the ore men have acted none too promptly in the premises.

In view of the grave condition of things portrayed, *The Iron Trade Review* deemed it of importance that an investigation should be had of the present and prospective coal and ore-handling facilities of Lake Erie ports; and accordingly it dispatched at once a special correspondent and artist to the various ports, with instructions to obtain such data and make such sketches as would throw light upon the subject. The first of this series of articles appears in the present issue, and takes up the history, growth, present condition, and future prospects of the port of Buffalo. The facts set forth have been obtained at first hands and from the highest official sources accessible, and can be relied upon as reasonably accurate. Buffalo has certainly shown marvelous progress in the development of its lake commerce, and its future advancement would seem to be assured.

Other articles covering Erie, Ashtabula, Fairport, Cleveland, Lorain, Huron, Sandusky and Toledo, will follow consecutively, and we trust that the series will prove of interest and value not only to those engaged immediately in the Lake Superior coal and ore trade, but to iron and steel manufacturers generally.

THE STRUCTURAL IRON MARKET.

One branch of iron manufacturing, at least, continues to enjoy a large degree of prosperity. The structural iron mills seem to experience no let-up in the heavy demands made upon them. Not only are we making large quantities for home consumption, but a New York house recently made a contract for all the structural work and all the shafting for a large cotton factory in Brazil. Besides the heavy demand for building purposes, the bridge-builders are in the market for large quantities, having apparently secured a great deal of work of late. The demand for new bridge-work comes most actively from Western railroads. A further encouraging feature is the fact that, while the order books of the structural iron manufacturers are full for some months ahead, there seems to be no cessation in the future demand, and steady employment appears to be assured for at least the remainder of the year. Prices are about as follows in four leading markets:

	New York.	Philadelphia.	Pittsburgh.	Chicago.
Sheared Plates	2.15c.@2.20c.	2.20c.@2.25c.	2.65c.@2.75c.	2.45c.@2.55c.
Angles	2.15c.@2.25c.	2.15c.@2.20c.	2.15c.@2.22c.	2.30c.
Tees	2.50c.@2.60c.	2.50c.@2.60c.	2.75c.@2.80c.	2.65c.
Beams and Channels	3.10c.	3.10c.	3.10c.	3.20c.

The rapid changes to iron and steel in the construction of heavy buildings still goes on, and a still greater field of activity is opening before the structural iron business.

THE NEW LAKE TONNAGE OF 1890.

Apropos of the consideration of the present and prospective ore and coal handling facilities of Lake Erie ports are the figures of new tonnage documented at the various lake ports during the first half of the present year, as collected by the *Marine Record*. From its elaborate table we obtain the fact that the new tonnage of the first six months is represented by 79 steam vessels, with a tonnage of 63,922, and 30 sailing and tow vessels with a gross tonnage of 15,559, making a total of 109 vessels having a gross measurement tonnage of 79,481 tons, including steel iron, composite and wooden vessels of first-class design and equipped with all modern inventions.

More closely studying the table, we find that of the new steamers 18 are vessels having a tonnage between 1,000 and 2,000 tons, and 13 have a tonnage between 2,000 and 3,000 tons. The average tonnage of the above 18 is 1,609 and of the 13 it is 2,307. It must be said, however, that from 15 to 35 per cent. should be added to the foregoing tonnage, as several of the modern high-classed, steel-built propellers are already on record as exceeding 3,000 tons capacity.

Of the above new steam tonnage (excluding the smaller vessels), Cleveland shipyards are to be credited with at least 30,000 tons, as against 12,000 tons for West Bay City, 11,000 tons for Detroit, and still smaller totals for Buffalo, Milwaukee, Grand Haven, Duluth, etc. The *Record*, however, remarks: "The above table will barely reach the hands of many of our readers, before several thousand tons more capacity will be added to the lake fleet, and be carried over to the next half-year's statistics." Altogether, the activity among the lake shipyards continues to be one of the marvels of Western enterprise, with every prospect of a long and successful run of prosperity.

AN UN-AMERICAN ATTITUDE.

The McKinley Tariff Bill still continues to engage the attention of our contemporaries across the water. The *Iron and Coal Trades Journal*, of July 4, contains the following:

It is reported that Mr. Blaine has received cablegrams from the American embassies at Berlin, Paris, Vienna and Madrid assuring him that the McKinley Bill is regarded as a declaration of commercial war, and that if the Bill is persisted in the Continental nations will respond by placing prohibitive duties on the principal American imports. We suggested in a recent issue that although our hands were tied in the matter, and though attempts on our part to influence the passage of the McKinley Bill would be futile and perhaps worse than useless, *there were interests within the boundaries of the United States identical with our own*, and these forces would exercise their power against the Bill. It seems that our Continental neighbors are disposed to have a voice in the question of transatlantic trade, and although Great Britain is the great market for American produce, the business of France and Germany, Austria and Spain, is of considerable magnitude, and the possible loss of it will not be viewed with indifference by the producers and exporters of America.

By the "interests within the United States identical with ours," the *Journal* doubtless refers to American importers and their faithful ally, the *American Artisan*. Certainly the *Artisan* can no more effectively further the interests of British manufacturers than by its present attitude. We commend it to a contemplation of itself as the willing tool of anti-American interests.

THE locomotive and car-building works are quite busy these days. As evidence of this we note the fact that the Illinois Central, the Rio Grande Western and the New York, Ontario and Western roads have just ordered twenty-five locomotives each, most of them of the heavy, eight-wheel pattern. The Cleveland, Cincinnati, Chicago and St. Louis Railroad has also contracted for ten heavy passenger engines Among the car works we note the placing of the following large orders: Denver and Rio Grande, 1,000 freight and 65 passenger; Louisville, New Orleans and Texas, 400 freight cars; New York, Ontario and Western, 1,500 coal cars; Atchison, Topeka and Santa Fe, 1,400 freight cars; Merchants' Dispatch Transportation Company, 250 refrigerator cars, and the American Cotton Oil Company, 325 tank cars.

A NOTABLE engineering event was the opening of the new Croton Aqueduct, in New York, last Tuesday. The new aqueduct is a tunnel of brick and masonry 33.12 miles long, from the Croton Lake gate-house to the Central Park gate-house. For the greater part of its length it is in the shape of a horseshoe, a little more than 13½ feet in height and 13 feet 7.2 inches wide. The old aqueduct is only 8½ feet high. The expenditures in the course of construction, according to report made to the Commission by Secretary Sheehan on July 10, are: Expenditures, vouchers and pay-roll, $2,550,200.79: contracts and agreements, $19,462,069.65; land and land damages, $52,726.39; Commissioners of Appraisals, $1,496,976.79; total, $23,561,973.62.

THE census supervisor at Pittsburgh advocates the consolidation of Pittsburgh, Allegheny and some sixteen suburban towns and hamlets, so as to bring the population of the united cities up to 401,445 and give Pittsburgh seventh rank. There is some reason for this in the mutual interests of the several communities, but it will take a generation to get rid of the local jealousies before such a consummation is reached.

THE business of the Sault Ste. Marie Canal in June exceeds that of any previous month in its history. Seventeen hundred and fifty-two vessels passed through the locks, having a total registered tonnage of 1,377,793, and a total freight tonnage of 1,413,001.

THE extremely hot weather, labor diffculties and the railroad strikes are seriousiy interfering with the Southern iron business. It is said that Southern furnaces have never experienced so much difficulty in securing labor.

THE *Wall Street News* calls attention to the fact that the first half of 1890 shows largest railroad earnings, much the largest traffic, and although the average of rates has been low, it will be notable for the large increase in profits.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES

July 1, 1890.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Week'y capacity.	CHARCOAL. Out of Bl'st. No.	CHARCOAL. Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	BITUMINOUS OR COKE. In Blast. No.	BITUMINOUS OR COKE. In Blast. Week'y capacity.	BITUMINOUS OR COKE. Out of Bl'st. No.	BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity.
New England	13	6	526	7	585	.....	.....	.....	.....	.....
New York	9	2	286	7	855	4	3	2,951	1	490
Pennsylvania	17	4	356	13	708	1	0	0	1	600
Upper Susquehanna Valley	.....	.....	.....	.....	.....	1	0	0	1	200
Pittsburgh	.....	.....	.....	.....	.....	21	19	24,231	2	2,055
Spiegel	.....	.....	.....	.....	.....	1	1	833	0	0
Allegheny Valley	.....	.....	.....	.....	.....	1	0	0	1	531
Shenango Valley	.....	.....	.....	.....	.....	19	17	12,770	2	1,125
Youghiogheny Valley	.....	.....	.....	.....	.....	5	3	1,479	2	832
Juniata and Conemaugh Valleys	.....	.....	.....	.....	.....	19	12	6,004	7	2,937
Spiegel	.....	.....	.....	.....	.....	1	0	0	1	250
Maryland	8	2	207	6	565	4	3	2,570	1	140
Virginia	19	3	156	16	877	12	10	5,618	2	566
North Carolina	2	1	98	1	85	.....	.....	.....	.....	.....
West Virginia	2	0	0	2	130	6	3	2,659	3	841
Ohio—Mahoning Valley	.....	.....	.....	.....	.....	14	12	9,943	2	1,144
Eastern, Central and Northern	.....	.....	.....	.....	.....	18	13	10,028	5	2,940
Hocking Valley	.....	.....	.....	.....	.....	15	4	1,429	11	2,664
Hanging Rock	12	6	439	6	532	13	7	1,319	6	1,242
Miscellaneous	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kentucky	.....	.....	.....	.....	.....	5	3	867	2	720
Hanging Rock	1	1	116	0	0	.....	.....	.....	.....	.....
Western Region and Miscellan'ous	2	0	0	2	154	.....	.....	.....	.....	.....
Tennessee	8	4	1,013	4	355	12	7	3,315	5	1,533
Georgia	3	2	303	1	98	2	2	1,217	0	0
Alabama	14	10	2,074	4	1,133	36	26	15,494	12	7,397
Indiana	.....	.....	.....	.....	.....	2	1	228	1	95
Illinois	.....	.....	.....	.....	.....	16	12	13,083	3	2,536
Michigan	26	14	5,134	12	2,994	1	0	0	1	300
Wisconsin	6	3	1,370	3	690	4	3	2,465	1	422
Minnesota	.....	.....	.....	.....	.....	1	0	0	1	140
Missouri	2	2	733	0	0	6	2	1,514	4	2,200
Texas	1	1	180	0	0	.....	.....	.....	.....	.....
Oregon	1	1	243	0	0	.....	.....	.....	.....	.....
Colorado	.....	.....	.....	.....	.....	2	1	406	1	350
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	1	0	0	1	205	.....	.....	.....	.....	.....
Total charcoal and coke	147	62	13,234	85	9,966	241	164	120,423	77	34,250
Total anthracite	177	114	45,038	63	19,376	.....	.....	.....	.....	.....

SUMMARY.

FUEL.	IN BLAST. Number. Month Previous.	IN BLAST. Number. Year Previous.	IN BLAST. Weekly Capacity.	IN BLAST. Weekly Capacity. Month Previous.	IN BLAST. Weekly Capacity. Year Previous.	OUT OF BLAST. Number. Month Previous.	OUT OF BLAST. Weekly Capacity.	OUT OF BLAST. Weekly Capacity. Month Previous.
Charcoal	62	58	63	13,234	13,001	11,204	85	90	9,966	10,309
Anthracite	114	118	90	45,038	45,132	31,848	63	60	19,336	17,948
Bituminous	164	164	131	120,423	123,820	89,356	77	81	34,250	35,338
Total	340	340	284	178,695	181,953	132,408	225	231	63,552	63,595

Electric Power vs. Steam Power for Small Plants.

The electric motor is probably the simplest and most compact piece of machinery ever made for producing power. As much as 25 horse-power of apparatus can be set up in a space less than five feet square, and where minimum of space is a desideratum this is an important point. There is only one moving part in the machine, *i. e.*, the armature, and only one set of bearings. The wear is entirely confined to the one set of babbitt shells, the commutator and the brushes, all of which form but a small part of the total cost of the machine, and all of which can be renewed when worn out, at a comparatively small cost. When this minimum of moving parts is compared with the number of levers, valves, rods, etc., required by a steam engine, and the necessary accompanying wear and tear, the reason for the low repair account of the electric motor, is manifest.

All the work which was formerly done by a steam engine in the printing department of Thurber, Whyland & Co. is now performed by a Sprague electric motor. According to Mr. F. B. Thurber all the work is now done in a more satisfactory and less expensive way than when steam power was used.

The space taken up by the motor is considerably less than that by the engine. In addition to this the attendance required by an electric motor is very much less than that required by a steam engine, being in general confined to a few minutes' attention each day, while the steam engine requires, while in operation, the constant attention of a skilled engineer. The following comparison of a few points of a steam engine and a Sprague electric motor, each of ten horse-power capacity, is interesting as showing the greater simplicity and economy of the electric machine:

	Motor.	Steam Engine.
Number of moving parts	1	9
" wearing "	5	20
Floor space (square inches	8¼	36
Room occupied (cubic feet)	16	216
Per. entage of mechanical friction	1	30
Actual H. P. percennage of indicated horse power.	100	80
Quarts of oil used per week	¼	12

—[Mining and Engineering Journal, New York.

An Outlet for Ore.

We take the following from the Toledo, O., correspondence to the *Marine Review*: The steamship Pontiac was in port this week, and unloaded at the Columbus docks, 2,496 gross tons of iron ore. This is the largest cargo of ore that has ever been brought into Toledo on the draft, which was 14 feet 8 inches aft and 14 feet 5 inches forward. This load was taken from Ashland to Cleveland, but could not be unloaded there on account of the dock blockade. The Columbus & Hocking Coal & Iron Co. then bought it and it was brought to this port, where it was unloaded onto the cars and shipped immediately to the furnaces. The blockade at other ports has resulted in a little extra being received at Toledo. At the Columbus wharves there was unloaded 6,000 tons and about 5,000 tons at the Ohio Central. The ore is not allowed to accumulate on the wharves. During the week shipments of coal from the Columbus wharves amounted to 10,000 tons. The Ohio Central shipped 16,000 tons. The statement for the month of June shows that the latter company received during that time at their wharves 16,407 tons of ore and shipped 47,040 tons of coal. This coal shipment is a decrease of 2,675 tons less than the amount for the same time last season, but it was made without any extra effort and is considered very good. June 1889 was boomed in order to make it a banner month. The coal shipments of the Ohio Central up to July this season were 89,434 tons. Rates continue unchanged with fair demand for tonnage.

A NOVEL WROUGHT IRON CHIMNEY.

The following are particulars of a wrought iron factory chimney, of a somewhat novel description, which has been built at Creusot. The total height is 279 feet, the diameter 23 feet at the base and 7 feet 6 inches at the top, the total weight being 80 tons, exclusive of masonry foundations. The latter are carried 3 feet 3 inches above the ground, and weigh about 300 tons. The shaft was built in successive rings, each 4 feet 1 inch high, the thickness varying from nine-sixteenths of an inch at the base to one-fourth of an inch at the top. The 9 lower rings were formed of 8 plates each. The base was encircled by a massive angle iron bolted to the foundation. The 8 lower rings were lined with fire brick. The erection of the chimney occupied 70 days, including taking down the flying scaffold.

The latter was of a somewhat novel character. It consisted of a central wrought iron tube 7 inches in diameter, and provided at the bottom with 4 wooden cross bars or arms, so clamped that their length could be adjusted to the varying diameter of the chimney and carrying the internal platform. These arms rested on angle brackets refitted to the interior of the plates. The upper part of the central tube carried 4 cross arms, or jibs, each consisting of a pair of timbers stiffened by making struts from the central tube. From the outer ends was slung the exterior circular platform.

The latter consisted of a pair of angle iron rings, to the outer part of which was riveted a plate iron fence, while the inner was provided with T iron stanchions. Radial bearing timbers, resting on these rings, and adjustable endwise to suit the varying diameter of the chimney, carried the platform, an annular space being left just sufficient for hoisting the plates. The latter operation was effected by a rope passing over an adjustable pulley fixed to each jib in turn, and carried down a central tube to a snatch block fixed at the bottom of the chimney. As each successive ring was riveted up, two pairs of bars were laid across, by which the scaffold was slung by four jack-screws furnished with ratchet collars, and thus raised high enough to take a bearing on the next set of angle brackets. The complete scaffold weighed about 4 tons, and the heaviest plate about 800 lbs. The total cost of the chimney, without foundations, was about $8,000.—[Industries.

Soft-Back Steel.

Announcement is made that M. A. Howell, Jr., London, has taken out a patent for improvements in the manufacture of soft-back steel. The invention relates to the manufacture of plates or flat bars of steel having one side highly carbonized, and the opposite practically free from carbon. Such steel is said to be less liable to break or crack while hardening and is more tenacious when in use where great rotary force or heavy blows or strains are required. Plates or flat bars of soft steel or fine iron, in pairs of equal size, are placed back to back with a film of clay or other refractory material inlaid between them. They are then clamped or wired together, and the several pairs are placed "in a receptacle or flask stratified between layers of granulated charcoal." The flask, furnished at one end with an inlet tube and cock, and at the other end with an outlet cock, is placed horizontally in a muffle. When the heat of the furnace has raised the temperature of the flask to a low red heat, a current of hydro-carbon vapor is driven over the plates, and when the heat reaches the cherry-red stage, the flow of gas is diminished, and the operation continued until the metal has taken up enough carbon. Finally the cocks are closed, and the flask is disconnected and allowed to cool in an atmosphere of hydrocarbon. When cool the receptacle is opened and the plates are taken out and forged, hardened and tempered in the usual way.

The Fastest Cruiser.

At the yards of Armstrong & Co., in Elswick, England, there was recently launched the armored cruiser *Necochea*, for the Argentine Republic, which is expected to be the fastest warship afloat. This vessel is 300 ft. long, 43 ft. beam and 3,200 tons displacement; she will carry two 21-cm. (8.27-in.) breech-loading rifles, eight 12-cm. (4.72-in.) rapid-fire guns and 24 smaller rapid-fire and machine guns, besides torpedo tubes.

EXCEPTIONALLY fine is the midsummer number of *Outing*. Among the articles of especial note are the following: "A Visit to Carthage and Tunis," by J. H. Cowperthwaite; "Yellowstone Park," by A. B. Guptill; "A Summer Abroad a-Wheel," by Frank M. Farwell; "Fly Trolling for Rock Bass at Night," by H. L. Strobridge; "Vermont's National Guard," by Lieut. Peter Leary, Jr., U. S. A., and "An Outing on the Soo," by A. S. Edwards.

RAND, McNally & Co., Chicago, have issued a pocket-size indexed sectional map of Michigan, showing the railroads, countries, organized townships, sections, rivers and creeks, together with every postoffice, railroad station, village and town, carefully indexed, referring to the exact location where each may be found on the map. It will be a convenient accession to every office connected in any way with the Lake Superior iron ore trade.

LAKE ERIE PORTS: THEIR COAL & IRON ORE HANDLING FACILITIES

I.—BUFFALO.

Buffalo Creek was made a port of entry in 1805, and in 1825 claimed an aggregate, in tonnage, for her shipping, of 1,050 tons, among which were one brig, eight schooners, one sloop, one steamboat, and four transportation boats. A pamphlet of that date, by a Mr. Ball, is authority for the following: "There are upwards of sixty sail of good substantial and safe vessels, owned upon this ake (Erie), forty two of which entered this port (Buffalo) last season, and there were 286 arrivals and an equal number of clearances."

What a change in the intervening years! The report of the Buffalo Merchants Exchange gives a total tonnage of 136,668.41 as the aggregate of 275 vessels for 1889, ending December 31. This tonnage is represented by 32 schooners, 190 steam vessels, 12 barges, and 41 canal boats. The distinct lake tonnage is 131,317.85 aggregated by 234 lake vessels.

The great strides made since 1825 are not alone represented by statistical figures, but in no small way by the remarkable activities in commerce, incident to the present facilities for carrying on the vast transportation of commodities between commercial centers. The present ease of access, compared to former days and the attendant hardships of those times, is far reaching in effect upon the population of large centers of trade in the multifarious divisions of pursuits, that these conditions have brought about.

Buffalo has been active in the rapid development of the lake trade, both in fostering the handling of commodities by canal and rail, as well as securing a rapid and large fleet of vessels to care for the traffic, with a rapid growth of the size and speed of the lake carriers and an existing facility of railroad terminals, and having excellent dockage room there has been a co-existent development of the business interests engaged in those pursuits, with the attendant result of producing for Buffalo a representative number of business firms and mercantile corporations to handle the long-established coal traffic too, and the growing iron ore commerce from the upper lakes, the former showing an increase of 73 3 per cent. in the last ten years, and the latter a percentage of increase for the same period of over 65.

The coal period of Buffalo dates from about 1829-30, when in conjunction with the Erie canal, the Delaware & Hudson Canal Co. were the first to operate from the Lackawanna basin, and to J. J. Albright, Sr., is due in no small measure the development of the hard coal trade of Buffalo. However, not until 1850 was hard coal considerably used for domestic purposes. In 1842 there were only five or six hundred tons of anthracite brought in.

There were about this time slight shipments of soft coal from Cleveland. Hard coal at the time retailed for $12.co per ton, the buyer doing the breaking to suit himself. The first lake shipment was consigned to Chicago, in 1842, and consisted of fifteen tons of Lehigh lump at $12.00 per ton, and it was doubtless shipped in hogsheads. This amount is very small compared with the Chicago receipts, by lake in 1887, which amounted to 853,158 tons. This first business in coal shipments by vessel was managed by Mr. G. R. Wilson, whose trade the second year (1843) amounted to 2,500 tons, and in 1877, the year of his death, to over 200,000 tons.

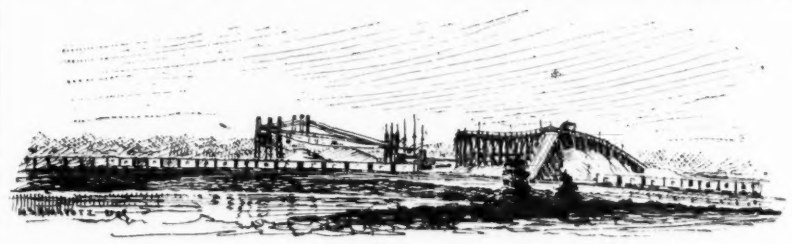
In these early years the bituminous supply was received by vessels from Cleveland and Erie. This traffic rose from 995 tons in 1845 to 34,665 tons in 1852, but in later years has dropped off altogether. The vessels of this period rarely carried over 40 or 50 tons, and were in reality only smacks as compared with the magnificent 2,500-3000 ton steamer of to-day, and the facilities for handling the shipments were correspondingly crude, being composed mainly of hoisting ropes and tackle blocks operated by horses, which means afforded the facility of loading a vessel of 500 tons burthen in two or three days. It was not until 1863 that any improvements were made in the handling plants. These, however, were only in the line of adaption to transfers from canal boats to vessels, and the rapid growing trade, with the new order of shipments by rail called for a radically different kind of improvements to handle the growing business. From these beginning have evolved the large shipping and stocking trestles, which are now so familiar a sight along the Buffalo lake front. In 1861, the Buffalo Anthracite Association reported a tonnage by vessel to the upper lakes of only about 12,000 tons, while in the three last years the coal exports and imports are found to be, viz:

			1887.	1888.	1889.
Total imports		anthracite, tons	3,497,203	4,549,015	4,338,570
"	"	bituminous, tons	1,776 217	1,892 823	2,198,327
"	"	blossburg, tons	25,000	22,590	22,500
"	exports	bituminous, tons	8,706	7,452	11,673
"		anthracite, tons	1,894,060	2 541,905	2,151,670
"	"	blossburg, tons	10,000	5,000	5,000

We are indebted to Mr. William Thurstone, Secretary of the Buffalo Merchants' Exchange, for the above and much valuable data respecting the coal and ore commerce of Buffalo.

In 1859 the first coal was brought in by rail, amounting to 9,100 tons This had increased to 45,578 tons in 1861. This trade of Buffalo in its exporting phases is not of any recent origin, but has been maintained for numbers of years, and, in fact, from the earliest means of exporting, shipments of coal to upper lake ports by vessel, for the importation of this one of nature's bountiful materials, was easily accomplished even prior to the railroad era, by the Erie canal entering Buffalo in 1826, and out of the early activity in this special line of commerce has grown the present large and extensive facilities in and around Buffalo, for handling the large amounts of coal that are shipped to and from that port.

The main systems of handling this immense business, which, in exportations, materially comprise the anthracite product, are the Lehigh Valley Co., having extensive pockets and large docks of recent construction, on what is known as the Tifft Farm, along the lake front, just beyond Buffalo Creek. They have also extensive storing trestles located to the east of the city at Cheecktowaga, where they have in process of construction, at this time, additional



GENERAL VIEW OF BUFFALO HARBOR.

The recent improvements on the Tifft Farm by the Lehigh Valley Railroad Co.

trestles and pockets for the storage of anthracite coal, and suitable means for its classification and re-shipment.

There are also the coal docks of the Delaware & Hudson Canal Co., which are located upon Buffalo Creek, and those of the Lackawanna & Western road, located at the entrance to Buffalo Creek, and the docks of the Reading system, operated by Albright & Co., lessees, whose extensive trestle is located at the foot of Georgia street, extending into the Erie basin.

There are also the bituminous coal docks of the H. K. Wick & Co., (incorporated) which are located along the Blackwell ship canal, and are the most extensive soft coal docks in Buffalo. These improvements of Wick & Co. have been made within the last few years, and are managed under their direct supervision. Access is had to the docks, located along the canal and river, by all the railroads entering Buffalo, through what is known as the Buffalo Creek Railroad. In operating their docks they use the McMyler derricks, and are also provided with two coal elevators.

The other docks which handle bituminous coal are the vessel fuel dock of Frank Williams & Co., located on Buffalo Creek, just about opposite the Bennett elevator, or near the life-saving station, and are under the management of William N. Burr.

In the anthracite traffic are the Pennsylvania Coal Co., located on the Blackwell Canal, nearly opposite the Buffalo Dock Co.'s ore dock.

There are also the docks of the New York, Lake Erie & Western Road, on the City Canal, and a number of other docks of a less capacity and size than those referred to. The whole facilities aggregate an average capacity of pockets of 36,300 tons. This is outside of the stocking or storage capacity with which the Lehigh Valley Road is so abundantly supplied in its dock No. 1, on the Blackwell Canal, and also the dock No. 2 on the Tifft Farm, as well as the storage capacities of a number of the other operators, and the average daily shipping capacity of all the docks runs up to 28,000 tons.

All the Lehigh Valley coal interests are supervised by J. H. Horton, General Superintendent, while those of the Pennsylvania Co. are under the management of Thomas Hodgson, Western Superintendent, and the Lackawanna & Western road nominally is under the management of Langdon & Co., while the Delaware & Hudson Canal Co.'s interests are taken care of by Joseph C. Batchelor, General Sales Agent.

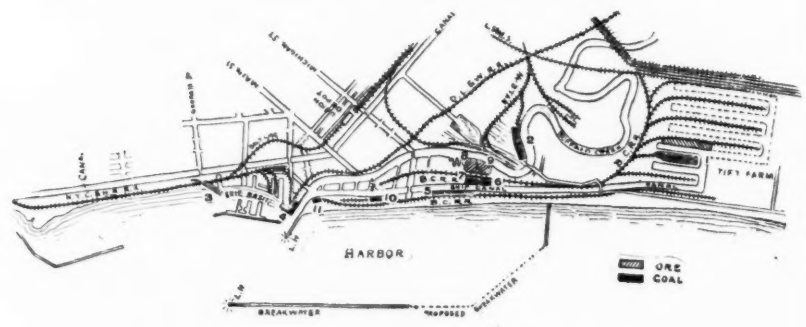
The dock facilities tributary to Buffalo Creek and the Blackwell Canal are all reached by the Buffalo Creek Railroad, which affords transportation and

transferring facilities for all the roads entering Buffalo, while the docks of the Lackawanna Co. are reached direct by the Lackawanna tracks entering Buffalo from the South, and those of the Reading Co. being reached over the New York Central & Hudson River route, the Delaware & Hudson Canal Co. having access by rail to and from their docks over the New York, Lake Erie & Western.

The length of dockage used by the coal interests of Buffalo aggregate all of 8,000 feet. Those of recent construction are the Reading docks, the H. K. Wick & Co.'s docks and the Tifft Farm improvements of the Lehigh Valley Co., also additions to the Lackawanna trestle, at the foot of Erie street.

The handling of anthracite coal at this port is increased quite materially by the large and extensive shipping facilities had, not alone at the docks, but as well at the extensive storage and stocking trestles located in East Buffalo, which are operated by the Reading road, Delaware, Lackawanna & Western, the Lehigh Valley and the Erie, while the Buffalo, Rochester & Pittsburgh Co. have also recently made quite large improvements, looking to a larger handling of coal products.

The storage plants are quite extensive, some of them reaching the capacity of 250,000 tons, and in this line the Lehigh Valley Co. are arranging to increase their present large terminal facilities by the erection of a storage plant on land acquired by them at East Buffalo, the capacity of which will be 175,000 tons, and will consist of a dumping trestle 35 feet high, and 1,200 feet long by 200 feet wide, covered by a building 90 feet high, and they propose to have standing room for 1,200 cars. A new set of shipping pockets has also been erected by the Delaware & Lackawanna road at the foot of Erie street during the Winter of '88-9. The iron trade of Buffalo is somewhat of recent date, and it is but of late years that this branch of commerce has received any material increase at Buffalo, but at the present time there are engaged in taking care of this traffic. The H. K. Wick & Co.'s docks operated by the Buffalo Dock Co., who have docks upon Blackwell's Canal, and upon the Erie Basin the Lackawanna Co.'s plant, and that of the N. Y., L. E. & W. Railroad known as the Minnesota dock, upon Buffalo Creek operated by Pickands, Mather & Co., and also the new facilities for handling ore of the Lehigh Valley Co., located upon one of the slips adjoining their anthracite coal docks on the Tifft Farm, which are managed by H. B. Abbott, Superintendent. The aggregate length of the



MAP OF BUFFALO HARBOR.

1.—The Lehigh Valley—hard coal and ore. 2.—The Delaware & Hudson Canal Co.—hard coal. 3.—The Reading docks—hard coal. 4.—The Lackawanna—hard coal and ore. 5.—The H. K. Wick & Co.—ore. 6.—The Lehigh Valley—hard coal. 7—The Pennsylvania Coal Co.—ha d coal. 8, 9.—Pickands, Mather & Co. and the Minnesota Iron Co.—ore. 10.—The H. K. Wick & Co.—soft coal. 11.—Frank Lewis & Co.—soft coal.

ore docks is over 4,000 feet, and the width about 600 feet, showing a capacity of 298,000 gross tons of ore, receipts in 1889, on a maximum daily capacity of some 5,000 tons. An illustration of the ample facilities for handling ore, is had in the data referring to the recent unloading of the steamer J. F. Eddy, of 2,033 tons in eighteen hours, which was accomplished at the Buffalo Dock Co.'s dock. Recently the propeller America with 2,841 tons of ore, began unloading her cargo at 7 A. M. and without working the following night was able to leave at 11 P. M. the next day with 2,800 tons of coal, having in this time unloaded her cargo of ore and taken the above amount of coal.

These docks use the following kinds of machinery for taking care of the ore as it comes from the vessels, viz.: the McMyler rotary derrick, and the Thornburg, or rather what is known as the Excelsior Iron Co.'s overhead swinging hoist, and the styles of conveying apparatus manufactured by the Brown Hoisting & Conveying Machine Co. As an evidence of the probable amount of coal and ore to be handled this year, the data for June will be an indication. The coal shipments, as entered at the custom house, were 220,274 tons; there were 64 cargoes not entered which aggregated 44,710 tons. The shipments for April were 120,100; May, 197,960, and in June 264,984, or a total of 583,044 tons since the opening of navigation. The iron ore receipts were 57,207 tons for June. The ore receipts for the last few years, were as follows, in gross tons;

1886.	1887.	1888.	1889.
31,869	286,699	240,000	298,000

The dockage facilities of Buffalo are somewhat extended, that is, they cover quite an area in extent, and by reason of the Blackwell shipping canal, which is owned by the city, and sometimes designated the City Shipping Canal, and the docks fronting on Bufialo Creek afford facilities for the moorage of large and extensive fleets of ore or coal carriers, taking in addition the dockage fronts and slips of the Erie Basin and those of the recent improvements by the Lehigh Valley Co. on the Tifft Farm, which latter are reached through the Blackwell Canal, together afford a commodious system of docks.

The entrance to the ship canal and to Buffalo Creek is but a very short distance from the lighthouse at the entrance to the Government channel leading in from the outer harbor. The outer harbor at present consists of a breakwater of the crib type, running nearly parallel with the shore for over a mile, and includes an area of anchorage of something over one-half a square mile, with a supply of water reaching over eighteen feet in depth.

It is proposed eventually to continue this portion of the breakwater still further along the shore southward, and extend out from the shore a meeting arm which will come up to within a number of hundred feet from the end of the proposed extension to the present structure, and allow an opening at this end of the harbor.

The superstructure of the present pier is being wholly substituted at present with solid stone, making when finished, the only solid stone pier on the entire lake system of Government improvements. There is also proposed a sea wall of masonry from the end of the south pier, as well as the shore inside of the breakwater to be protected by the same style of construction.

During 1889, 625 concrete blocks weighing 17 tons each were built for the new structure of the breakwater, and many of these have been placed in position.

On July 1st, 1889, there was a balance to the credit of Buffalo Harbor improvements of $100,194.07, and the estimated amount required to complete the existing project is $819,000. The Chief of Engineers, U. S. A., in his report October, 1889, estimated that the amount that can be profitably expended in fiscal year ending June 30, 1891, is $400,000.

PITTSBURGH PIPE MANUFACTURERS LOSE A BIG ORDER.

Some time ago the *Dispatch* published the fact that the wrought iron manufacturers of the city were crowded with orders and that the industry was never in as encouraging or promising shape as now, but it was not generally known at that time that orders were refused by the manufacturers because of an inability to fill them. For several days a Chicago concern, organized for the purpose of furnishing the Windy City with fuel gas, has been trying to place an order for 300 miles of 6 and 8-inch pipe. Counting the material at $1 a foot, which is about the average price, the order is worth over $1,500,000.

When Mr. Crane, representing the Chicago capitalists, came to this city, where he expected to have the greater portion of the material made, he found all of the mills overcrowded with orders. The National Tube Works refused to take any of the order on this account, as did also the Pennsylvania Tube Works. Mr. Crane was compelled to virtually peddle his order, and the most he could get any one mill to undertake was 30 miles. That was taken by Spang, Chalfant & Co. A little less than one-third of the entire order was left in Pittsburgh, and the remainder was distributed among the Eastern mills.

It leaked out several days ago that a very large order for pipe had been placed, but the manufacturers kept the matter quiet, largely on account of the difficulty at the National Tube Works. A *Dispatch* reporter called at the office of the American Tube & Iron Co. yesterday. The General Manager, R. W. Carroll, did not deny that a large order was being placed, but he declined to give the particulars, saying he thought it unwise to do so at present. The next call made was at the office of the Pennsylvania Tube Works. The Secretary, William H. Latshaw, furnished the above information.

In addition it was learned that when Mr. Crane first came to Pittsburgh some of the manufacturers were afraid to undertake to put out any of the material until they learned who was back of the concern in Chicago. The size of the order frightened them, and one or two of the mills refused to make any of the pipe until they investigated the matter. They found that Potter Palmer and "Old Hutch," the grain dealer, were financially interested in the enterprise.

It is not known how much capital the Chicago Co. has started in with, but it is composed of men capable of putting up almost any amount. It is the intention to carry gas from the Indiana fields into Chicago for fuel purposes. Some of the contracts for laying the pipe have already been let, and it is expected the lines will be laid to the Illinois State line by November 1. Here two large pumping stations will be erected for the purpose of forcing the gas into Chicago.—[Pittsburgh Dispatch, July 16.

Pittsburgh Steel Plates.

Some surprise has been expressed that no American manufacturers have responded to the United States Navy Department's invitation to submit armor plates for a competitive test to be made shortly at Annapolis. The test will be made, but the Government will have to be content with three samples of armor plate bought abroad. This apparent lack of enterprise is really a token of the satisfactory condition of the iron and steel business in this country. The manufacturers in Pittsburgh are simply too busy to make armor plates for experimental purposes. They are making armor plates for the new vessels of our navy in great quantities. This is no new branch of the steel business for years Pittsburgh has supplied Uncle Sam with steel shields for his ships. To-day there is a large corps of naval officers in Pittsburgh for the special purpose of inspecting the steel made for the Government. It is a recognized fact that Pittsburgh can turn out more steel and better steel than any other American city. Even the constructors of war vessels on the Pacific coast send to Pittsburgh for their armor plates.

The manufacturers of steel in Pittsburgh are not uneasy about the quality of foreign productions. They are properly confident in their ability to compete with the world. American men-of-war will continue to wear home-made plates as long as Pittsburgh is in the steel business.—[Pittsburgh Dispatch.

CAREFUL investigations show only 1 per cent. of foreclosures on farm mortgages in Kalamazoo county, Mich., from 1879 to 1883. Seventy-five per cent. of the mortgages given in these years have been discharged, and not more than one-half of those given from 1879 to 1889 are now in force. Mortgages on real estate in cities and villages are larger in total volume than those on farms. The "farm mortgage" argument is going to pieces. It does not agree with the facts.—[Bulletin.

THE OUTLOOK FOR THE ENGLISH IRON TRADE.

In the latter half of last year, when the boom in iron began to assume dangerous proportions, we pointed out that the gamble upon which the speculators in pig iron warrants were entering, though it might carry prices very much above the then level, would inevitably lead to a grave condition of things and be followed by a serious re-action. Subsequent events have only too forcibly proved that our warning was not given without careful consideration. From under 43s. per ton for Scotch pig warrants in June last, the price was lifted to nearly 64s. in November, and in the same period Middlesbrough No. 3 pigs went up from under 39s. to 67s. per ton; while West Coast Bessemer advance from about 50s. to 78s. Early in this year even these quotations were exceeded, Bessemer at one time going to nearly 84s. We do not for a moment suggest that a good deal of the rise in prices was not justified. The trade demand at home and the requirements for export had shown a steady expansion, and in spite of a large increase in production stocks were continuously reduced. Still, there can be no doubt that the upward movement owed a great deal of its importance and sucess to those who, forsaking for the time, Stock Exchange securities, plunged headlong into wild speculation in pig warrants. Prices were pushed up to such a level that purchasers became paralysed, for concurrently with the rise in iron, coal and labor had steadily become more costly. The inevitable results followed. Consumption received a serious check, the holders of warrants became alarmed and hurried to close their bargains, and buyers, recognizing that the back of the speculation had been broken, went in simply for hand-to-mouth purchaser. Where, as in this case, there was such a predominance of would-be sellers, it was only reasonable to assume that prices would come down, and they did come down with a run, until a few weeks ago the whole of the previous 12 months' advance had been dissipated. A few of the more knowing operators have, no doubt, made a big haul from both movements of the pendulum, but by far the greater number of those who participated in the gamble have, we imagine, made a resolution to leave "pigs" severely alone in future. In the interests of the trade of the country, if not in their own, it is much to be hoped that a good resolution formed with so much reason will be rigidly kept.

When we last referred to the position and prospects of the iron market, we expressed the opinion that the retrograde movement was probably being overdone. It is a matter of common observation, that a rapid decline in the value of any commodity following upon an important movement in an upward direction, generally takes the price lower than the actual conditions of supply and demand would warrant, and this was clearly the case with regard to the "slump" in iron. Already prices have risen about a couple of shillings a ton all round from the lowest point touched, and unless some unforeseen circumstances should upset all reasonable calculations, it is highly probable that the advance will make further progress. In the first place, it is to be observed that production has been considerably lessened. Owing to the extravagant prices reached a few months ago, makers found it necessary to curtail their purchases of the raw commodity, and at the present time the number of furnaces in blast is only about the same as it was a year ago. Secondly, it is to be noted that although home requirements have fallen off a good deal, the demand for the United States and some of our leading customers in the East is as brisk as ever, if not brisker. The consequence is that the depletion of stocks has gone on apace. A year or so ago the stocks of pig iron in Connal's stores at Glasgow amounted to nearly 1,030,000 tons; at the end of last week they were barely 720,000 tons, and at Middlesbrough the stocks in public stores have in the same period declined from about 220,000 tons to well under 100,000 tons. Thus, in the two centres, despite the increase of production, which went on for the greater part of the twelvemonth, the stocks of pig iron are now about 430,000 tons less than they were a year ago. On the West Coast also the stocks of hematite iron have run down from 417,000 to about 295,000 tons; so that in all directions there is the same evidence as to the enormous extent to which stocks have been depleted.

The main causes of the slackened condition of enterprises, which of course prevents a rise in prices, are the excessive cost of fuel and the indisposition of the wage-earning classes to bow to the altered condition of things, and accept lower rates of payment. In consequence of these factors recent prices for raw and manufactured iron, which would have left a decent margin of profit a year or two ago, have been quite unremunerative. We can scarcely believe, however, that coal-owners and wage-earners will stand out for the maintenance of current rates when they see that their obstinacy would have such serious results as have lately been threatened, and it is an encouraging sign that in one or two districts lower wages and lower prices for coal are being accepted, and a revival in the trades using raw iron, and the consequent further demand for that metal for home consumption may be looked for. The export demand, as we have said, continues exceedingly good, so that if a policy of give and take be adopted all round, and if at the same time there be no revival of the gambling in warrants, which has worked so much evil in the past, it is more than probable that the condition of the iron trade will continue to improve. We do not look for a recurrence of the absurdly high prices ruling a few months ago; indeed, nothing could be more detrimental to the industry, but with the conditions of supply and demand such as they are, the recovery ought to make further headway.—[Financial Times, London.

Going for Benner.

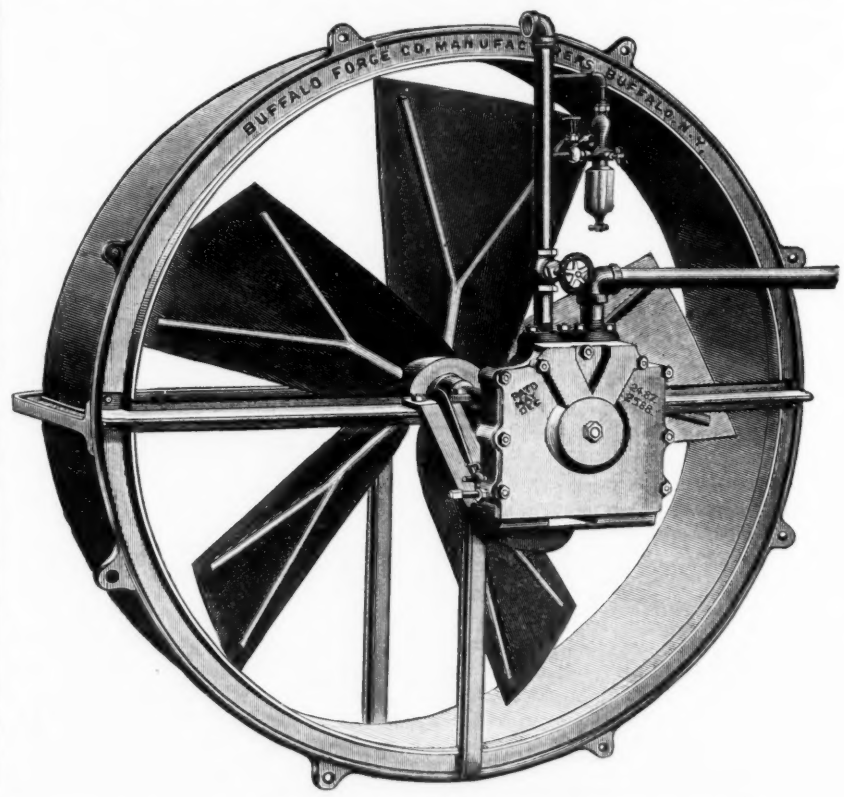
"Cold Short," in *Ohio Valley Manufacturer*, goes for the pig iron prophet thus: "What's become of Benner and his bottle holders? Time is wearing away, and conditions will have to get up and dust from September onward, to get up that $50 iron boom for this year. Judging from present indications and the tone of the trade's pulse, I hazard the suggestion that the old man missed a star or skipped a constellation, when he was getting up his forecast. I do not believe prices will go higher than $20@21 this year, but will hover about the average $20.50, when they get to their best. I will be honest enough to state that this belief is founded on hope as well as judgment, for I am convinced that a repetition this Fall of last year's $24 folly, would bring about a reaction, the disastrous effects of which would not wear off for several years. Both bung and spigot seem to have been knocked out of the British era of prosperity by speculative greed and business over-reachings, and opportunity has been suffered to leak away before it had been more than half utilized. This, it is true, is not our affair, nevertheless it creates a far-reaching, sympathetic influence, and it teaches us to be very vigilant and conservative."

BUFFALO DISK WHEELS WITH DIRECT ATTACHED ENGINE.

There are numerous places where the best application of a ventilating fan requires the use of direct attached engine on account of the impracticability and expense of supplying power by belt connection, which often exceeds the first cost of an engine, to say nothing of subsequent expense for maintenance. We take pleasure in showing herewith the latest design of a direct engine as is now furnished in capacities suited to run the different sizes of the Buffalo disk fans.

These engines are constructed with special reference for the work and occupy but little space, though capable of driving the fan at high speed without noticeable vibration or noise. It will be noted that their appearance is neat and compact, occupying little more space than is required for belt connections, while they require only a small amount of attention to keep in running order. With using an engine there is no lost motion by slipping or wearing of belts, while the rate of speed may be easily increased or diminished as the work requires, and there is perfect control of the fan as to starting or stopping instantly.

This engine, which is double reciprocating with two pistons, will work as well upside down and bolted to beams overhead, or placed with cover end down with shaft in a perpendicular position, as in the regular way. Their



durability is also a special feature. The engine is in a casing, in which a rectangular piston is held to move backward and forward horizontally. This piston has a chamber in which an inner piston is mounted in a center on a crank pin, projecting through a slot in the back plate of the outer piston, the crank pin being secured to a crank disk on the inner end of the main driving shaft. The pistons are held steam tight to the face of the cover by two plates inserted in the back of the outer piston, and acting as slides on the back of the case, which is fitted to receive them. These plates are acted upon by steam let in between them and the back of the outer piston, and are of the right area in each size of engine, so that they hold the pistons back and front without loss of steam, and, at the same time, no loss of power by friction. The wear of the outer piston is taken up by plates on the under side of which are inclines sliding on corresponding inclines in the bottom of the casing, whereby the pressure of the bottom plate upon the piston can be readily adjusted by means of set screws on the outside of the case. The wear of the inner piston is provided for by detachable slides, at the ends. Coiled steel wire springs pocketed in the ends of the pistons hold the slides firmly to the planed surface of the inside of the outer piston, in which the inner piston moves up and down. There are only two bearings in the body of the engine, and main journal and the crank-pin. These are in the form of bushings, and are made of the best quality of phosphor bronze and give no trouble in the way of cutting and heating From the manner in which the steam is applied to the moving parts they are less liable to wear than in the ordinary engine.

The Buffalo Forge Co, of Buffalo, N. Y., will be pleased to furnish further information upon applic ation.

AN $8,000,000 ship canal is to be built by a French company, connecting Delaware and Chesapeake bays.

LAHMAN-KIRKWOOD PATENT SHAKING AND DUMPING GRATE BARS.

The cut given herewith very clearly shows the construction and operation of a simple and very effective shaking and dumping grate, manufactured by W. H. Lahman, Marine Building, Lake street, Chicago. The nearer portion shows the grate ready for fire, the further shows it dumped. The following claims are made for this grate by the manufacturer:

First. There are no high ridges to burn off. No holes to choke up. No cast-iron cross-pieces to bend, or continuous castings to warp.

Second. They combine strength, lightness and durability.

Third. The few working parts are strong and simple in construction, and consequently are not liable to get out of order. The finger pieces rest on wrought-iron cross bars, and are made in interchangeable sections of a few pounds each, permitting the air to circulate freely, keeping them and the fingers cool, and absolutely preventing warping. These sections can be readily replaced if necessary, without trouble and at a nominal cost.

Fourth. They last longer. The large amount of air space (over 50 per cent.) being equally distributed, together with the construction above described, keeps the grate from burning out, and at the same time greatly facilitates the combustion of the coal and its gases.

Fifth. Clinkers cannot cling to them. When shaken the fingers press into and separate the fuel, and thus prevent clinkers from forming, and the same motion thoroughly cleans the fire without allowing any coal to fall through.

Sixth. Pea, slack, screenings and other inferior descriptions of coal, hard and soft, can be burned with better results than on any other grate, and without waste of fuel.

Seventh. They increase the capacity of boilers from 15 to 25 per cent. This is very important where boilers have sometimes to be forced to their full capacity, or where quick steam is required, as in water works and electric light plants.

Eighth. When necessary, the fire can be pushed to either side, and the ashes and cinders dumped instantaneously into the ash pit and the same operation performed for the other door. Thus the old-fashioned "cleaning out" is

avoided, it being unnecessary, with this grate, to let the fire burn out or the steam run down for this purpose, but a continuous, even pressure is maintained and a considerable saving of fuel and labor is effected.

Ninth. A very important feature also is that while dumping, the door being kept closed, no current of cold air can strike the expanded boiler shell, causing the sudden contraction which is so injurious to boilers. This exclusion of cold air, it will readily be seen, is also a great fuel saver, and during the above process, all gas, dust and smoke passes up the chimney, thus insuring perfect cleanliness, which is so desirable for churches, schools, public and private buildings. Engineers, too, will appreciate this.

Tenth. The grate is made to fit the furnace, no alteration of brick-work, no cutting of slots or other change of boiler front is necessary when putting it in.

Eleventh. Grate locks itself after shaking or dumping when shaker lever is withdrawn, thus preventing injury, from being left in an improper position.

Further particulars, prices, illustrated circulars, etc., may be obtained by addressing the manufacturer, W. H. Lahman, Marine Building, Lake Street, Chicago, Ill.

WHAT IS CAST STEEL?

Sir Henry Bessemer, answering an enquirer in *The Engineer*, says:

In reply, I would remark that there are known in commerce several different kinds of steel, each bearing a name which more or less accurately indicates its modes of manufacture or its specific character. Thus we have blister steel, shear steel, double shear, German or natural steel, and puddled steel, in all of which the bars are produced by the union or welding together of solid pieces, a process which gives to them a more or less laminated structure, and consequently an admixture of scoria or other extraneous matters between the different layers of which the bar is composed.

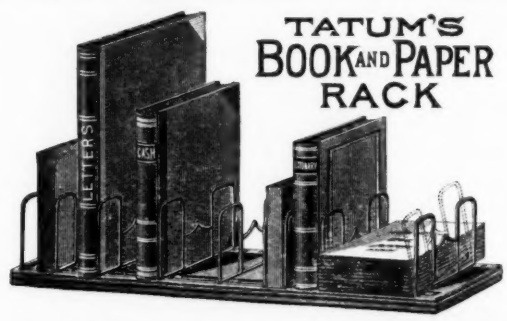
Huntsman's great invention consists simply in fusing such imperfect steel bars in a crucible, and, while in a fluid state, casting the molten steel into an ingot, whereby the laminated characted of the steel bar is lost, and its mechanically mixed scoria is separated from it. The cast ingot so produced forms a homogeneous mass, which is crystalline in structure and perfectly free from lamination, admixture with scoria, or other extraneous solid matter, all of which advantages are derived from the fluid condition of the metal, and its being cast or run into a mold, and hence such steel is distinguished by the very correct and obvious name of cast steel. There is in this great transformation no particular virtue in the crucible itself, which is only a means to an end; that end, and all the advantages flowing from it, is simply derived from the fluidity of the metal, and the casting therefrom a homogeneous mass.

Your correspondent naively remarks that "it would simplify matters if the generic titles of 'crucible' and 'Bessemer' were kept separate, and not allowed to become confused in any way by the connection of the term cast steel." However much it may be desired by some persons to draw a hard-and-fast line that shall separate Bessemer steel from crucible steel, it is impossible to do so, for they are indissolubly united in the same category by one great distinctive character which is common to each process, viz., the fluid condition of both products, and the formation of this fluid into an ingot or homogeneous mass by the act of casting. Nor is this all, for Bessemer steel, like crucible steel, may be either mild or highly carburetted at the will of the manufacturers; it may, like crucible steel, be alloyed during the process with any other metal, and, like crucible steel, it may be of good or bad quality, dependent chiefly on the quality of the raw material put into the crucible for the converter.

And further, it may be said that Bessemer steel, like crucible steel, is crystalline in structure, and not laminated; it breaks like crucible steel with a beautiful conchoidal fracture, and may, like fluid crucible steel, be made into a vast variety of useful articles by founding or casting in suitable molds; and, in fact, Bessemer steel is identical with crucible steel in its molecular structure, its chemical constituents, and in its physical properties, and is in all respects as true cast steel as that made in the crucible.

TATUM'S BOOK AND PAPER RACK.

The accompanying engraving represents a very useful office article. It may be used as a desk attachment, or may find place on a table, or at the top of a book case or cabinet. It is an adjustable book and paper rack. The compartments are readily adjusted with one hand to any required distance, and it



has the advantage that there are no wires to bend out of shape or get loose. It is adapted to hold heavy books or light papers. The article is manufactured by Samuel C. Tatum & Co., Cincinnati, O., and is furnished in seven sizes, ranging in length from 12 to 36 inches, and having from 8 to 25 compartments. Each size is furnished in two styles, with enameled compartments, and also with plated compartments.

Cost of Transmitting Power.

The following comparisons of cost of transmission of power by various methods have appeared in the *Revue Universelle des Mines:* (1) Comparative cost on 10 horse-power transmitted 1,093 yards—by cables, 1.77 per effective horse-power per hour; by electricty, 2.21; by hydraulics, 2.90; by compressed air, 2.98. (2.) Comparative cost on 50 horse power transmitted 1,093 yards—by cables, 1.35 per effective horse-power per hour; by hydraulics, 1.87; by electricity, 2.07; by compressed air, 2.29. (3.) Comparative cost on 10 effective horse-power transmitted 5,465 yards—by electricity, 2.64 per effective horse-power per hour; by compressed air, 4.66; by cables, 4.69; by hydraulics, 5.29. (4.) Comparative cost on 50 effective horse-power transmitted 5.465 yards—by electricity, 2.37 per effective horse-power per hour; by cables, 2.65; by compressed air, 2.89; by hydraulics, 3.02. Steam was the prime mover used in each of the above instances, and it appears that for long distances electricity takes the lead in economy over all other systems. It has also a great advantage in the facility with which the power may be subdivided, and there appears to be no doubt that in future coal mining, electricity will be much used for coal-cutting, tunneling, hauling, pumping, etc., as well as for lighting.

IT is a fact that shouting into a telephone is not so effective as a moderate tone of voice. The reason is plain. Since the diaphragm can only vibrate so much under any circumstances, a violent sound-blow simply breaks up the vibrations into chatters or rebounds, so to speak, from the normal vibration due to the capacity of the diaphragm. Most persons use a telephone as though it were a speaking trumpet, and it was necessary to roar in it. If they would find the tone or volume of sound necessary to the distance traveled, and use that, the work done would be much better, and less nervous energy would be expended.—[Engineer.

A VAST sum was sunk in the temporary plant used in building the Forth bridge. The engineers estimated that £500,000 was spent in this direction alone. In scaffolding, flooring, shedding, etc., 1,000,000 cubic feet of timber were used. From first to last 1,200 tons of mere service bolts were needed to hold the material together. Scores of hydraulic jacks, sixty miles of wire rope, and rams innumerable, were also among the temporary appliances employed.—[Engineer.

AMONG THE IRON MINES.

Lake Superior Shipments of Iron Ore:—

Lake shipments of iron ore from the mines of Lake Superior, for the season of 1890, up to Wednesday, July 9th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	202	Humboldt	7,303	Prince of Wales	8,109
Barnum	2,818	Imperial	6,775	Prout	5,479
Buffalo	34,828	Jackson	45,125	Queen	34,184
Cambria	32,991	Lake Superior	120,726	Republic	81,925
Champion	88,578	Lillie	14,907	Republic Reduction Co.	1,115
Cleveland	101,475	Lucy	21,305	Salisbury	36,585
Cliffs Shaft	64,865	Marquette Ore Co.	1,057	South Buffalo	39,122
Detroit	1,230	Michigamme	23,348	Volunteer	48,045
Dexter	630	Milwaukee	15,861	Winthrop	43,252
East New York	15,393	Negaunee	28,286		
Grand Rapids	3,443	Pitts. & L. Angeline	105,815		
Total, Marquette Range					1,033,777

MENOMINEE RANGE.

Aragon	6,755	Half and Half	383	Paint River	19,800
Armenia	12,654	Hamilton	9,357	Perkins	3,113
Chapin	273,327	Iron River	54,515	Pewabic	9,036
Commonwealth	42,199	Ludington	28,020	Shafer	23,873
Cyclops	25,317	Mastodon	28,329	Sheridan	595
Dunn	54,475	Millie	13,789	Vulcan	51,821
Florence	63,806	Monitor	3,641	Youngstown	13,347
Great Western	29,968	Norway	25,820		
Total, Menominee Range					793,940

GOGEBIC RANGE.

Albany	11,044	Father Hennepin	4,200	Pabst	40 376
Anvil	15,575	Federal	1,638	Palms	11,358
Ashland	177,345	First National	105	Ruby	2,380
Aurora	99,432	Germania	19,457	Section 33	34,908
Brotherton	17,349	Iron Belt	41,446	Superior	8,227
Cary	21,342	Montreal	6,330	Trezona	23,861
Colby	96,953	Mt. Hope	21,174	Windsor	13,088
Eureka	3,959	Norrie	323,047		
Total, Gogebic Range					1,002,138

VERMILION RANGE.

Minnesota Iron Co.	175,305	Chandler	106,630
Total, Vermilion Range			281,935
Grand Totals			3,111,790
To corresponding date of 1889			2,598,642

The shipment of iron ore from the Lake Superior ranges goes on at an accelerated pace. By steam on land and steam on water, aided by innumerable human hands, the precious commodity, which the world must have, is being forwarded to market with a haste that makes no account of night and day. The shipments for the week are the largest of the season, for a similar period, reaching an aggregate of 357,015 tons. The Marquette range has been in the lead all the season with the Gogebic in hot pursuit. The older district made a spurt during the week reported, and is now 31,639 tons ahead of her vigorous young competitor. As a reason for the Gogebic's falling back, it is claimed that there is a glut of ore at the Ashland docks, there being a lack of vessels to receive it. The Vermilion is still behind her shipments of 1889, while the Menominee range is gaining rapidly.

Lake Superior Mining Notes:—

MARQUETTE RANGE.

No mining work has yet been done in the east end of Section 16 of the Lake Superior Iron Co., it being desirous to give the ground every chance to come away if so disposed. The new shaft at the west end of the property is now in softer ground and indications are favorable for the striking of hematite ore. This would be pleasing, no doubt, as it would be easier to sink through and would help to pay for the work of sinking.—[Iron Ore.

Some 75,000 tons of ore yet remain in the stock piles at the Schlesinger mines on the East Range, which with a product of nearly 50,000 tons per month, and that already forwarded, will make a fair showing for the first year of the new management, especially in view of the fact that the underground workings have undergone an entire change, and the system on the surface has likewise been entirely remodeled. New machinery calculated to facilitate the work and greatly increase the product, will be ready for use within a few days.—[Iron Herald.

MENOMINEE RANGE.

The old Crystal Falls mine near the falls of that name, on lot No. 3 of section twenty, which has so long been abandoned is to be overhauled and wrought. The ore taken from the property was the highest in iron of any yet found in the district. It was the first property opened here and produced but about 1,500 tons, being but a pocket, but that is only characteristic of the formation in that locality, and the opinion is liberally offered that a little exploratory work would show another pocket or series of pockets. It is well worth a trial.—[Diamond Drill.

The Lake Chicagon mine is showing up finely. The vein has been opened up or cross-cut, to a width of forty feet, and numerous test pits have been put down, which demonstrates the fact that the vein is an extensive one. It is rumored that the E. I. M. & W. R. R. will extend its Dunn line. Another rumor is to the effect that Schlesinger syndicate will run a branch line to Iron River from near Stager, and then another branch from that up past the south end of Chicagon lake to the mine on section twenty-six, 43-34.—[Diamond Drill.

The railroad extension to the Hemlock River mine will cost in the neighborhood of $200,000, but the Chicago & North Western Railroad Co., has that confidence in the property that it will not hesitate to build the road, the work having already been commenced.—[Diamond Drill.

Ever since the discovery and development of the Chapin mine there has been a persistent effort to discover the western extension of the vein, but it has so far proved to be a fruitless search. It is lost in the Ludington property and so far as present developments are concerned, is known to exist as a large and valuable deposit only in the Chapin, Hamilton and Ludington mines. The prospector has refused to believe that beyond this territory the great Chapin vein pinches out to nothing of value, hence within the past ten years probably a quarter of a million dollars have been spent prospecting the territory between 25, 40-30 and the Menominee river with no better result than the discovery of a lean ore, promising enough to induce men of small means engaged in the search to squander their all, and the rich ones to invest their thousands until they were finally discouraged. At the Chapin mine the foot wall is a lean ore and red slate formation, the red slates lying close up to the ore, and the hanging is limestone. There are irregular deposits of exceptionally fine ore in the lean ore formation south of the Chapin, as in the case of the Millie, and recent developments have proven that the work heretofore done west of the Ludington has been done in this formation and not in the Chapin vein proper. A mountain of sandstone and limestone rises west of the Ludington, directly in the path of the western extension of the Chapin vein, which has complicated the geological problem presented. At the present time Geo. St. Clair is exploring on the n. e. ¼ s. e. ¼ 26, 40-30, about 150 feet south of the quarter post, where a shaft had been sunk by the Penn Iron Co. and a drift had been made to the south 400 feet, when further work was abandoned. Mr. St. Clair is sinking another shaft 400 feet west on the strike of the vein, but his work is not yet sufficiently advanced to give definite results. He has, however, made a a discovery of some importance, it being a silurian deposit of ore of excellent quality varying from four to nine feet in thickness. Carl Anderson is working a sandstone quarry on this property, which lies flat over the slates, the latter standing almost perpendicular. Over the sandstone is limestone and over the latter the silurian deposit. There is now abont 500 tons of the ore on the dump and a cut up the hill for a short distance exposed about 6,000 tons. The stripping is very light and the cost of mining will be correspondingly low. This deposit will furnish immediate returns that will pay the expense of sinking a shaft now started and drifting in the ore which is believed to lie under the sandstone. All the property west of St. Clair's two forties for four miles are held under option by Messrs. H. S. Benjamin, James Sawyer, W. J. Turner and W. H. Timlin, of Milwaukee, and J. T. Jones, Superintendent of the Hamilton mine, this city.—[Menominee Range, Iron Mountain.

CHEAP POWER FOR MANUFACTURING.

The average water mill is a poor affair; one time running briskly, another time slowly or perhaps shut up because "there ain't no water in the dam." Oftentimes water is stored when there is a freshet so as to tide droughts. This, however, is expensive and uncertain. The Niagara River is an exception in the way of rivers. With the great Lake Erie behind it, it never lags nor grows weary, neither having seasons of droughts nor devastating freshets. The Androscoggin, Merrimac, Shetucket or Connecticut Rivers may grow feeble as the season advances, but the noble Niagara is ever the same—robustious, swelling, tumultuous.

An eminent physicist, once visiting the historic falls of this river, predicted the approach of a day when the mighty energy running to waste would, while transformed into electricity, be utilized to run the mills and workshops and even the railroads far and near. Tunnels and races, with turbine wheels at the ends of them. This was the means he suggested. A large portion of the prophecy remains to be fulfilled, though looking by no means as impracticable and visionary as when uttered. The beginning of the scheme, however, is near, the plans having been arranged, the men and money found, so it is at least reported, to construct a tunnel leading from the river which will gather from it in the shape of running water a total energy of 120,000 horse-power, or about one-tenth of one per cent. of the whole energy of the stream.

Doubtless this is an exaggeration; we have never seen an estimate of this kind that was not, but that enormous parcels of power may be thus collected there is no doubt whatever. Should it be carried out as now designed, it is likely to lead to important changes in more than one description of manufacture, for, however circumscribed its limits may appear, they are capable, by the interposition of electricity, of being almost indefinitely extended, because, by the simple stretching of a copper main this cheap power may be economically transmitted for several miles on every hand.

The economical transmission of large parcels of power is a problem now engaging some of the best minds of the day; little by little the apparatus is being perfected, the distance increased till now we are told by electricians that at a not distant day, the removal of the obstacles which now interpose to to prevent 100 or 500 horse-power being transmitted hundreds of miles will be *un fait accompli.*—[American Journal of Railway Appliances.

Not 8 Hours, but 12.

The people demand a full day when they go on an excursion, and twelve hours they shall have at Niagara Falls, if they go via Nickel Plate, Saturday night, July 19th, at 10 P. M. $3 round trip. 224 Bank Street, 598 Pearl Street and depots.

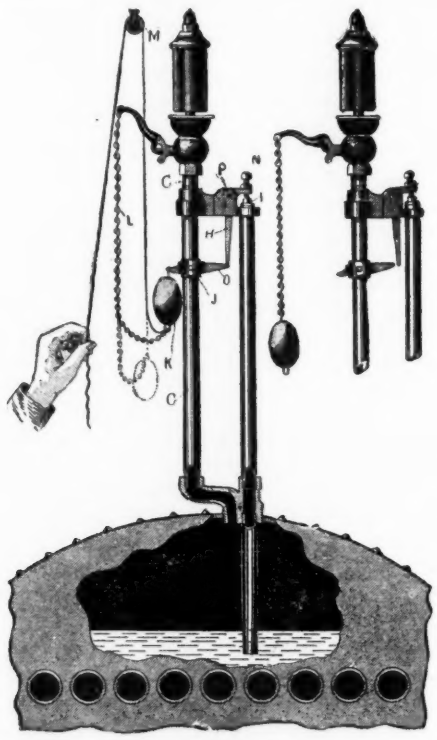
THE American do not want any closer relations with us. We are not welcome to their market. They buy from us with the utmost reluctance, and it is their aim to stop buying the very moment they can do without our products. The United States market has all along been a market of convenience, and in the nature of things it could never have been reasonably expected that the Americans would go on buying agricultural products from us in increasing quantities.—[London (Ontario, Can.) Free Press.

A MARINE railway, twenty-five miles in length, connecting the Gulf of St. Lawrence with the Bay of Funday across the Isthmus of Chignecto, will be completed by September next. Large sailing vessels which cannot go through the Strait of Canso will save 700 miles by this route, while steamers to St. John, N. B., from the St. Lawrence River will economize 500 miles. As this will be the first marine railway to be built, the results of the enterprise will be looked for with interest.—[Philadelphia Record.

IMPROVED LOW WATER ALARM.

The Fox improved low-water alarm is a very simple contrivance, based upon the well-understood principle of the expansion of metal in proportion to the amount of heat to which it is subjected. The working of the contrivance can be seen at once by referring to the accompanying cut. As long as the water remains above the bottom of the inserted pipe, the copper tube is full of water at a temperature of about 211° F, the pressure of the elastic steam exerted upon the face of the water forcing the water in boiler up the tube, just as atmospheric pressure does in the case of an ordinary pump. As soon as the water in the boiler falls below the bottom of the pipe, the water in copper tube runs out by force of gravity, and steam takes its place, at a temperature of 260° F. at 20 lb. pressure, or 324° F. at 75 lb. pressure. This difference of temperature—48° to 112° according to pressure—causes an expansion of the copper tube in the direction of its length, of from 1-100 to 3-100 of an inch. The apparatus is so proportioned that one-half of the former amount is sufficient to move the bottom of the lever H from the catch O—which releases the end of the yoke that is pivoted at J; whereupon the weight K slips off the yoke and sounds the whistle. As soon as the water again enters the pipe, the weight can be replaced.

In order to clean the copper tube inside, the lever H is removable, also the plug I in top of copper tube, which arrangement admits of a swab being run through the tube to remove any sediment. If the boiler is using bad



water, it is good practice to clean the pipe frequently. It is scarcely necessary to say that the bottom end of the inserted pipe should not be less than four inches above the top of flues, or crown sheet. This would then be the low water line, below which the water should never be permitted to go. The apparatus can be attached by any engineer. Manufactured by the Fox Machine Co., Grand Rapids, Mich.

EASTERN IRON MEN OPPOSE THE AMALGAMATED SCHEDULE.

All is not clear sailing for the Amalgamated Association of Iron & Steel Workers in their attempt to induce manufacturers east of the Alleghenies to subscribe to the scale of wages recently adopted at Pittsburgh, says the Philadelphia *Record:* A number of the establishments with headquarters in this city seem unwilling to sign the wage schedule, and adopt the classification of work which the association sent out on July 1. The scale for puddling proposed is $5 50 per ton, when the schedule price for bar iron is 2 cents per ton, wages to advance 10 cents per ton for every advance of one-tenth cent per pound in the price of iron. The workers fixed their minimum basis at 2 cents per pound, and no matter how much below that figure iron descends, wages are to remain the same. As one big mill-owner expressed it, "it is a sliding scale, but must always slide upwards."

Eastern Pennsylvania mills have been paying $4 per ton for puddling, even when the price of iron went below 2 cents per pound, as it is now. This was agreed to in 1886 by the mill-owners, and has been in operation ever since. West of the Alleghenies the cost of puddling is $5.50 per ton on 2-cent iron, and the aforementioned advance system is strictly adhered to. The Pittsburgh mills can afford to pay $1.25 more a ton for puddling iron than the Eastern mills, because their fuel is much cheaper. The majority of the mill hands east of the Alleghenies are non-union, but the union people stick to their Western brethern's ideas, and demand that the new scale shall be signed.

So far as can now be learned, and it is stated upon the very best authority, only two mills in this part of the State have signed the scale. They are Hughes & Patterson, and Gaulbert, McFadden & Caskey, both of Philadelphia. It is pretty well understood that no one in the Schuylkill Valley has yet complied with the association's request, and some of the mills of the Susquehanna district are in a similar position. The Lehigh Valley people are not yet ready to sign, and the Coatesville mill-owners have positively declared that they will not comply. An official connected with the Phœnix Iron Co., of this city, said yesterday that they had not signed, but declined to state whether they intended to do so or not. It comes from a very good source that the Penncoyd Iron Works have not agreed to the new scale, and will hesitate long before doing so.

Joseph F. Bailey, who has large iron interests, and who represents several mills, said that his people would be affected by the scale, but had not yet complied with it. As the mills are pretty generally closed now for repairs, it is hard to tell how many of them will start up again at the usual time. The Cambria Iron & Steel Works will not be affected as an Eastern concern, although their offices are here. The plant is so close to Pittsburgh that it is controlled by the Western influences. Edmund D. Smith, of the Pennsylvania Steel Co., said his firm would not be affected by the scale, for their mills were in Harrisburg, and their men non-association.

Justice Cox, Jr., of Justice Cox, Jr., & Co., representing the Catasauqua Works and the Chickies furnaces, who also operate extensively in the Susquehanna region, said; "We have not yet signed the scale. It is not a question of wages, however, in the East; but what we object to is to have a set of people dictate to us what wages we shall pay. Neither our Catasauqua or Danville mills have agreed to the scale. We are willing to pay the $4-per-ton rate, and do pay it. But if we, or anybody else on this side of the Alleghenies, were to pay Pittsburgh wages, it would shut up every mill. Their coal and gas facilities far exceed our fuel opportunities, and we cannot afford to pay the wages they do. A few Western bosses are trying to rule the State. They are endeavoring to force Western wages upon the Eastern mills, but they can't do it. When I came into the iron businsss in this city, there were five iron mills in Philadelphia. Now there are two. The Amalgamated Association shut up the other three. My impression is that the whole thing will fall through. The big mills will go on the same as ever, even though some of their workmen do belong to the association."

Electric Drills at the Brooklyn Navy Yard.

In the construction of a modern iron ship an enormous number of holes must be drilled through plates varying in thickness from half an inch to 1½ inches, and sometimes thicker, often in very inconvenient positions and under such conditions that the work must be done at a decided disadvantage. Such, for example, is the case on board the monitor "Miantonomah" in the Brooklyn Navy Yard, now being rapidly completed, where a vast amount of drilling has to be done around the turrets intended for the great 10-inch rifles, and perhaps from the interior of the turret and in a position where the use of power drills would seem well nigh impossible.

The box containing the electric drill is about 18 inches long over all, and bears beside the motor only a reel of wire for connecting with the source of power and the flexible shaft that operates the drill. Once clamped in position, the motor, which in the case referred to runs 2,800 turns per minute, but is geared down to comparatively low speed, does its work with great efficiency and an inch hole can be drilled through half-inch iron in less than 30 seconds, while a couple of men handling the machine can accomplish an amount of work that appears prodigious to one who is used to the clumsy hand methods of drilling or steam power drills that require elaborate setting up, and are exceedingly inconvenient to move around. The reduction of speed by gearing is necessarily great, but is accomplished with comparatively little noise and wear, and the flexible shaft, six or eight feet in length, which connects the motor with the drill proper, enables the drill to be used in the most contracted positions.—[Engineering and Mining Journal.

Six Months Fire Loss.

Both underwriters and the country at large may congratulate themselves on diminution in the fire waste for the first half of 1890 as compared with the corresponding period of 1889. As compiled by the New York *Commercial Bulletin* the figures for the first six months of 1890 show a gain of $16,474,755 over the like period of 1889 and a gain of $19,469,605 over the first half of 1888. The following shows the losses in detail:

	1888.	1889.	1890.
January	$16,040,000	$ 6,898,700	$ 9,179,300
February	11,213,500	12,802,000	7,387,025
March	9 918,100	10,912,000	8,466,300
April	11,326.350	15,987,000	8,284,520
May	9 188,500	9,915 300	8,838,100
une	9,594,400	7,755.000	5,655,000
Total	$67,280,850	$64,286,000	$47,811,245

This reduction in fire loss represents just so much saved of the resources of the country. Property burned represents just so much wealth wiped out; insurance only distributes the loss over the community. A large proportion of this reduction is due to the work of automatic sprinklers and to the instructions given by the various inspection bureaus.

During June there was 154 fires of a greater destructiveness than $10,000 each, classified as follows: 63 fires of from $10,000 to $20,000 each, 64 of from $20,000 to $50,000, 18 of from $50,000 to $100,000, and 9 of from $100,000 to $150,000.

A Wise Conclusion.

Referring to the Senate amendments to the McKinley Tariff Bill, the London *Coal and Iron Trades Review* says: The amended tariff, it is evident, is in many respects less favorable to the foreign exporter than the one that was introduced to the House of Representatives, some months ago. As the American people are still by a very large majority in favor of Protection, it seems to us futile to expect that the Senate will reject the scheme, and thereby run counter to the general sentiment. For good or ill Protection is the fiscal creed of the great Republic at present, and it will probably remain so for many years to come.

Can Not Be Stopped.

So let's go and see Niagara Falls, Saturday night, July 19th, via Nickel Plate, at 10 P. M. Twelve hours at the Falls for $3, and home for business early Monday morning. 224 Bank Street, 578 Pearl Street and depots.

THE "UNIVERSAL FURNACE."

Dr. J. Baxeres, a well-know metallurgist of Oporto, has recently brought out a remarkably ingenious invention, to which he has given the name of the "Universal Furnace." The theory involved in the perfection of this valuable invention has long been familiar to metallurgists, but it has been reserved to Dr. Baxeres to solve a problem which has hitherto baffled the skill even of the most ingenious. This furnace will smelt and refine in a single operation, and by what is known to chemists as the dry process, every description of mineral, no matter what its composition might be—whether poor or complex, silicious or pyritous, and even sulpho-arsenurets are as effectually reduced by its operation as any other metallic compound. Thus ores of iron, lead, zinc, copper, antimony, nickel, tin, silver, gold, etc., can all be readily fused by this method, which is based upon the chemical affinity of the alkalis and salts of alkaline and alkaline-earthy metals with volatile elements and with the metalloids mineralizing the metals, thereby forming definite salts, including oxides, hydroxides, sulphurets, arseniates, antimoniates, etc., from which the metal is obtained in a free state, with or without the addition of carbon, or in other words, completely demineralised. This result is obtained by melting the minerals, after trituration and mixing in definite proportions with oxides of salts of potassium, calcium, magnesium, or barium, or with their carbonates, nitrates, sulphates, fluorates, borates, chlorides, etc., any of these substances, alone or in combination, and with the addition, if necessary, of a simple flux, appropriate to the substance to be treated. The reduction is effected by means of closed crucibles of iron or other refractory material capable of resisting the highest temperatures, and these crucibles subjected to the action of circular involving flames, kept in continuous action, form the chief features of the furnace. Thus far as regards what we may call the chemistry of the Baxeres process. The advantages of the process are very numerous, and may be briefly enumerated as under:

1st. The possibility to reduce the minerals expeditiously and without loss on the very spot where they are extracted, thus realizing the difficult problem of the immediate conversion of the substance into marketable value.

2nd. To profitably treat at the mouth of the mines the most impure and complex minerals of the richer species, avoiding the usual costly mechanical concentrations and expensive transport of the minerals, and obtaining at the moment of extraction the full metallic value of the minerals, together with the whole of the gold or silver contained in them.

3rd. The easy utilization of refuse, waste matter and metallic dross of lead, copper, nickel, silver and gold, by melting on the spot.

4th. By the temperatures easily obtained and controlled, in this furnace, from a low point to the highest, to suit all necessary metallurgical formulæ, it is possible to obtain by successive operations, firstly, a metal of a low fusion point; secondly, another of a medium point; and thirdly, another of a high point, etc., thereby solving a great desideratum in the metallurgy of complex minerals, from which, until now, it has been well nigh impracticable to extract the whole of their metals.

5th. By means of the closed crucibles the furnace transforms the mineralizing elements of the metals into definite salts, and leaving at liberty (with the great advantage of suffering no loss by volatilization) the greater part, which is capable of yielding pure metals in a single operation, besides the important benefit of not contaminating the atmosphere either with injurious gases or with phosphoric, arsenical, antimonial, and other poisonous vapors.

6th. The facility of transporting these furnaces and erecting them in the most isolated regions, thus overcoming the hitherto insurmountable difficulties encountered in the treatment of ores on the spot.

7th. When once erected any of these furnaces can be maintained at a trifling cost; they are simple and easy to manipulate, and do not require much personal attention; they are economical in the consumption of fuel, which may be wood, turf, peat, lignite, coal, coke, etc., consuming, in fact, any kind of fuel; high temperatures are easily maintained without intermission, as it is only necessary to recharge and graduate fuel and draught, in order to keep up the required fusing point.

We need hardly point out that, as a general rule, a modern blast furnace, with all its gear and necessary machinery, ventilators, motors, generators, etc., will require an outlay of from £15,000 to £25,000, whilst a Baxeres furnace of etc., would not represent an outlay of over £5,000. In a modern blast furnace, the maximum model, including furnace, installation of feeders, mixers, crusher, on account of the expense of fuel, melting materials, labor, etc., every ton of ingots produced costs on an average 25s.; but in a Baxeres furnace the cost, as a rule, rarely exceeds 10s. per ton. A modern blast furnace is bound to be kept continuously at work, through the risk of otherwise imperilling its structure by cooling, contraction, expansion, etc., whilst the Baxeres furnace can be lighted, worked, and extinguished at any time, and without risk of any kind. Moreover, a modern blast furnace can effect, at the utmost, three charges during twenty-four hours, which, calculated at a high average of 75 tons at a time, makes a daily total of 200 to 250 tons; whilst the Baxeres furnace is able to complete fifty discharges in the twenty-four hours, or a round output of 500 tons daily. The quality of the ingot produced by the "Universal Furnace" is claimed to be very much superior to that obtained by the modern blast furnace, the former being a chemically pure product, although it may have been obtained from the poorest and foulest minerals from marshy districts. This result is due to its reduction having been effected without the ores being brought in contact with the combustible matter, as happens in the ordinary blast furnace. In the metallurgy of the simple and complex species of silver minerals, the advantages of the "Universal Furnace" are of the greatest importance. No preparatory mechanical concentrations for example are necessary, the silver standard being sufficently remunerative. Calcinations for the purpose of volatilizing the mineralizing elements, such as sulphur, arsenic, antimony, etc., are, of course, obviated also. Amalgamation is, moreover, dispensed with, so that the absolute elimination of quicksilver, which is replaced more rapidly and economically by the lead minerals, impregnated by silver or gold, up to 75 or 80 per cent., is likewise secured. On these grounds, therefore, it is contended that the adaptation of the Baxeres furnaces to all the mineral products enumerated, and more especially to gold and silver, cannot fail to bring about one of the most important industrial revolutions of the present generation. We have only to add that the furnace has been in operation for some years past in the works of Messrs. Baxeres & Co., at Oporto, and that the claims made on its behalf by the inventor are supported by unimpeachable testimony. —[Iron and Coal Trades Review, London.

CONDITION OF THE HARDWARE MARKET.

The same hopeful feeling that has characterized the whole season still prevails, and there are few who believe that there will be anything else than a good business during the rest of the year. Business, however, has been restricted considerably within the past few days. The excessively warm days in the West left houses relying upon the orders from that section without business; then the semi-annual stock-taking had some effect, but most potent was the triple holiday, with its anticipation and the day or two of business demoralization following after. The travelers of the leading houses are all generally in, a few being absent in the South. Some buyers have straggled through the city on their way to Summer resorts, and the number will now become larger as the heated season progresses. Houses doing a Pacific Coast trade report a dull business. It is believed that the hardware trade in that section is in a healthy condition, but that heavy shipments have temporarily overstocked the market. Oregon and Washington are in better shape, however, than the rest of the States in this respect. Alaska constantly takes limited shipments of heavy goods.

There have been large importations of guns during the fortnight, which are being thoroughly distributed, and more probably will be made during the present month. As these were made in anticipation of a higher tariff, heavy stocks near the consumer may have an important bearing on the business of the coming season. The same is true of imported cutlery, although the arrivals are not now so marked. The Custom House revenues on all foreign goods are now very large, so much so that bank reserves have decreased surprisingly during the past week. This, considering the heavy payments at this time of the year, may turn into an important factor in making prices of domestic goods if the drain continues. In ammunition the same state of affairs as mentioned in the last *Hardware* continues. Orders for loaded shells are taken with reluctance, and jobbers are asking for an advance.

The market for strap and T hinges has developed lower prices. Statements have been made of an agreement by manufacturers to maintain former prices, but subsequent events proved these to be incorrect. Jobbers are creating some irregularity by shading the low prices given. The Case Butt Association hold prices very firm, and goods are sold up so closely that no break is anticipated. Butt-pressed nuts have been slightly advanced in some instances.

Common carriage bolts have been reduced in price, in accordance with the action taken at the late meeting of the manufacturers. There are evidences of some dissatisfaction with the change, and the prices are not steady. There is some irregularity in the price of iron door and padlocks. Other locks are held very strong.

The pick-axe combination is not so strong as could be hoped. A prominent manufacturer is stubborn, and the maintenance of prices, even at the reduction, is constantly jeopardized. The Axe & Tool Association, which was organized in March, with headquarters at Troy, N. Y., and which soon afterward advanced the price of axes $2 per dozen, hold quotations very firm. The Association has withdrawn most of its agencies, made a scarcity in stocks, and for the present at least has matters well in hand.—[Hardware.

Gambling in Pig Iron Warrants.

The committee appointed by the Iron Trade Association to consider the question of undue speculation in pig iron warrants have decided on their report, and a meeting has been summoned for July 2nd to receive and consider it. The committee consists of Mr. Hingley, M. P., Mr. Ainslie, M. P., and Mr. Isaac Wilson, M. P. They are in favor of a bill being introduced on the lines of Leeman's act, requiring that the number and description of the warrant shall be inserted in all contracts. As we stated in our last issue, such an act may be neglected; but this will be only in ordinary cases in quiet times. In periods of speculation it will be brought into requisition. It will act as a deterrent. Such an act cannot affect dealings and speculation in pig iron. Speculation is a necessary element in all trades, and nothing should be attempted to interfere with this except when it passes the bounds of safety. The bill must be carefully drawn, and, if opportunities are watched and availed of, there is no reason why it should not become law this session. The committee had an interview with the Attorney-General, and explained the matter to him; of course, they do not expect Government at this period of the session, and in the present state of public business, to take it up, but we believe Government will support the bill, and give any facilities in their power. We do not expect that the bill will meet with any strong opposition. But it will be necessary that the bill should not only be approved by the Iron Trade Association, but that it has the hearty support of such representative men as Sir J. Pease and Sir B. Samuelson, and others in the House. The promoters of the bill, if they introduce it at all, are bound to take effectual measures to secure its becoming law.—[London Iron and Coal Trades Review.

NICKEL PLATE Niagara Falls excursion tickets of Saturday night, July 19th, cost but $3 for the round trip. Train leaves 10 P. M. City ticket offices: 224 Bank Street, 598 Pearl Street and depots.

INDUSTRIAL SUMMARY.

New Enterprises :—

A $75,000 company has been organized at Harriman, Tenn., to manufacture all kinds of farming implements.

The American Ice Machine Co., of Fort Wayne, Ind., have been organized with a capital stock of $1,000,000.

The Roane Iron Co., of Rockwood, Tenn., is negotiating with H. Howe & Co., of Cortland, N. Y., to establish stove works at the former place.

The American Concave Spring Co. is incorporated, with $30,000 capital stock, and an office in Jersey City. The company will manufacture and sell springs.

The Tennessee Mining & Improvement Co. announce their intention of building an iron furnace at Watauga, Tenn., that will be one of the largest in the South.

A corporation to be known as the Devonshire Manufacturing Co. has been organized at Portland, Me., for the purpose of manufacturing all kinds of machinery.

The Cowles Engineering Co., at Jersey City, N. J., has been incorporated with a capital of $150,000. The company will manufacture and sell Cowles' water-tube boilers.

The Salem Gas Stove Manufacturing Co., of Salem, Va., has been organized with G. W. Palmer, of Saltville, President, and A. M. Benman, Vice-President, to manufacture gas stoves.

The Belfont Iron Works Co. and the Kelly Nail & Iron Co., both of Ironton, O., have definitely decided to erect a steel plant. Work on it will probably be commenced in a short time.

The Marion Iron Works has been organized at Marion, S. C., with W. J. Montgomery as President; R. Jordan, Secretary and Treasurer, and E. McDuffie as Superintendent.

At Washington, Ga., the Washington Foundry & Manufacturing Co. have been incorporated by Sims & Barnett, Flaker Brothers and A. W. Adams and others, with a capital stock of $15,000.

West Superior, Wis., capitalists are considering the advisability of organizing a stock company for the manufacture of safes at that place. The company is said to have $200,000 at their command.

A. Bierbower, J. W. Merriam and Robert Van Sands, of Chicago, have incorporated the Arnold Refrigerator Car Co. for the manufacture of refrigerator cars. The capital stock of the company is $1,000,000.

The Thill Coupling Co., with $10,000 capital stock, has been incorporated at Roanoke, Va., by J. O. Kinsey, L. L. Powell, G. Y. Booker, and others, to establish a plant for the manufacture of a patent car coupler.

George Yellot and G. R. Shock, of Baltimore county, Md., W. T. Roberts and others have incorporated the Maryland Bolt & Lock Nut Co., to manufacture a patent bolt and nut lock. The capital stock is $100,000.

A company headed by H. B. Tompkins have decided to erect a $150,000 pipe works at Sheffield, Ala., on a site of 20 acres, donated by the Sheffield Land, Iron & Coal Co. The capacity of the plant is to be 150 tons per day.

The Fuller & Warren Stove Co., of Milwaukee, Wis., mention of which was recently made in these columns, has filed articles of incorporation, with a capital of $500,000 and will give employment to 800 men. The company also has a large plant at Troy, N. Y.

The Great Western Iron & Steel Co., of Seattle, Wash., has been incorporated, to lease or own iron, coal and other mines, and to build foundries, rolling mills and works for the manufacture of coke, etc. The capital stock of the company is placed at $1,000,000.

A partnership has recently been formed at Grand Rapids, Mich., entitled Tallman & Co., composed of William B. Tallman, Frederick A. Gorham, Richard R. Metheany and Edgar M. Metheany, for the purpose of manufacturing and selling the Tallman patent railroad signal holder.

A company has been formed by a party of McKeesport and Pittsburgh men, to operate a machine and foundry works, and locate the works about two miles above McKeesport. The projectors are G. W. Taylor and Oscar Krueger, of McKeesport, Pa. The company will operate under a capital of $65,000.

Messrs. Aaron J. Palmer, of Amherst, and J. A. Crossman and John A. Laws, of the Enterprise Foundry, Sackville, have organized themselves under the name and firm of Cumberland Foundry & Machine Works, at Amherst, Can. They intend carrying on a general foundry and machine business, repairing, etc.

The National Lathe & Tool Co., Philadelphia, Pa., have been for some time desirous that the Board of Trade would offer some inducement for them to locate in Cleveland. The company is a large one, and turns out excellent work. The committee on manufactories and promotion met last week, but no definite action was taken. The company is said to have plenty of capital, and the plant will make a valuable addition to Cleveland's manufacturing interests, should it decide to locate here.

It is understood that O. C. Barber and others of the syndicate that purchased land at New Portage, O., propose as soon as possible to erect there one of the largest boiler works in this part of Ohio. The company will probably be known as the National Boiler Co., and when built and running will employ between 200 and 300 men. Some Eastern capitalists not directly connected with the original New Portage land syndicate are associated with Mr. Barber in this enterprise.—[Akron (O) Beacon.

A new manufacturing site has been selected along the line of the Southwest Penn road, where a nail plant is to be erected, and where a new town to be known as Emens is to be built. The place is about six miles from Greensburg, and has a good water supply for steam manufacturing and resident purposes. The Taylor Wire Nail Co. is putting up a plant for the manufacture of a three-cornered wire nail. Three extensive buildings will constitute the factory; one for drawing the wire, a cutting department, and warehouse and shipping department. The machine for making the nails is a new invention. The product is received with a great deal of interest, and it is believed that the three-cornered nail will eventually become the standard nail of the world. The company has secured patents that give them the control of the entire trade. About 600 men will be given employment by the new works, and the new town of Emens promises to be a lively neighbor for Westmoreland's county seat.—[Pittsburgh Dispatch.

Press dispatches from Bradford, Pa., state that a tract of 5,500 acres in McKean county, near Bradford, has been purchased by the Steel Tubular Car Co., and upon it will be located the town of Charmony, which, it is expected, will rival Pullman as a car-building metropolis. A model city is to be laid out with neat cottages, perfect drainage, water and light systems, and all under the control of the company. The capital of the company is $5,000,000, half of which was secured a few days since by an English syndicate; the remainder is in the hands of people throughout the United States. John S. Orr, of New York is President; Col. A. I. Wilcox, Vice-President; John W. Post, General Manager, and the following board of directors: Henry E. Perrine, Harlon C. Palmer, John G. Valentine, Col. J. A. Marrow, Givon Pike, H. C. Low, M. T. E. Chandler, Col. R. F. Young, H. D. Money and E. John Ellis. The main building is to be E-shaped, having three fronts of 644 and two 580x60 feet, five stories high, each 18⅔ feet, built of stone to the third story, the remainder being brick.

The following new companies were granted licenses of incorporation by the Secretary of State of Illinois: Cyclone Crusher Co., Chicago; to manufacture mining machinery, capital, $200,000; incorporators, Henry W. Hinsdale, Henry Colber, Horace J. Clark.—Pan-American Engineering & Construction Co., Chicago; to promote engineering and agricultural works and projects; capital, $500,000; incorporators, William A. Stiles, Harry B. Waterman, I. J. Gill.—Schwedland Galvanized Iron Cornice Works, at Chicago; to manufacture, sell and contract for galvanized iron cornice, etc.; capital stock, $2,000; incorporators, A. Dreyer, R. Schwedland, and T. Schwedland.—The Eyelet Button-Hole Scissor Co., at East St. Louis; to manufacture button-hole scissors; capital stock, $100,000; incorporators, E. O. Bartholomew, J. T. Cheney, and G. W. Calluis.—Pullman Electric Motor Co., at Chicago, to manufacture sewing machines and electric motors; capital stock, $200,000; incorporators: E. N. Talbot, H. B. Seymour, and L. H. Bisbee.—Chicago Axe Co., at Chicago; to manufacture and sell axes, hatchets and other tools; capital, $30,000; incorporators, Robert Kennedy, John S. Given, Jr., and William G. Pullman.—H. Phillips Manufacturing Co., at Chicago; to manufacture extension pliers and other specialties; capital stock, $50,000; incorporators, Henry Phillips, H. W. Smith, and Frank Sharpland.—United States Filter Manufacturing Co., Chicago; to manufacture filters; capital, $100,000; incorporators, Herman Vollmer, Horace L. Brand, William H. Bullen.

Enlargements, Additions, Removals, Etc.:—

The National Pipe Bending Co., New Haven, Conn., will build a new factory.

The Pennsylvania Tube Co., of Pittsburgh, have increased their capital stock from $1,200,000 to $1,600,000.

It is probable that large boiler works will be erected at Carthage, Mo., in connection with the Carthage Foundry.

The Chester (Pa.) Rolling Mill Co., at a recent meeting, voted to increase their capital stock from $600,000 to $1,000,000.

The Oil City (Pa.) Boiler Works are rebuilding their shops recently destroyed by fire. The new shops will be 180x280 feet.

A. K. Ragig & Co., of Columbus, O., have, it is reported, made a proposition to move their foundry and machine shops to Fort Payne, Ala.

The Alikanna rolling mill, Steubenville, O, will be moved to McKeesport, Pa, the company having closed the purchase of 12 acres of ground, near Riverton. The works will employ 500 men.

It is reported that the Milwaukee (Wis.) Bridge & Iron Co. contemplates the erection of a new plant at Milwaukee. The main building will be 600x100, and the works, exclusive of machinery, will cost $175,000 This will double the present capacity.

The American Bridge Co., of Roanoke, Va, has ordered $20,000 worth of new machinery, as recently stated, and has received a large lathe for use at the works. An extensive addition is being made to the foundry, and arrangements completed for the construction of an additional building, 75x100 feet in dimensions.

Business men of Westfield, Mass., have subscribed $40,000 for the purpose of buying out the Westfield Plate Co., now located at Thompsonville, Conn., and moving it to Westfield. A meeting of the subscribers voted not to accept the proposition of the managers of the concern, and further negotiations are in progress. If the factory is taken to Westfield, an added $20,000 will be raised for working capital.—[American Machinist.

Furnaces and Works Starting Up:—

Ivanhoe Furnace, after a season of idleness, resumed operations on the 17th ult.

The Cherokee Iron Co.'s furnace, at Cedartown, Ga., which has been idle for nearly two years, and which has been enlarged and thoroughly overhauled, was put in blast on June 16th.

General Industrial Notes:—

The Scranton Steel Co., of Scranton, Pa., made during the six months ending June 30, 1890, 101, 441 gross tons of steel rails.

The Walton Architectural Iron Co., of Cincinnati, O., have the contract for the iron work for the Carew Building now going up on the corner of Fifth and Vine streets.

Bickford Drill Co., northwest corner of Front and Pike streets, Cincinnati, O., report doing very large business in their line of machinists' tools, and are

— BLACK DIAMOND —

PREPARED ROOFING

Cheap and Durable. Water and Fire Proof.

Building and Sheathing Papers, Deadening Felts

☞ SAMPLES AND PRICES SENT ON APPLICATION. CORRESPONDENCE SOLICITED. ☜

S. E. BARRETT MFG. CO., 70 La Salle St., Chicago, Ill.

having all they can do. They have orders enough to keep them busy for six months to come.

Rogers, Brown & Merwin, Chicago, Ill., announce their removal from No. 309 Rookery Building, to offices, Nos. 971 and 973 Rookery Building. The change of location will give far better facilities for the handling of pig iron, and all matters pertaining to it will receive careful attention.

The manufacture of steel nails is an important industry, and the first ever made by the Gleason nail machine in the South, were turned out at the Fort Payne (Ala.) rolling mill, week before last. It is believed that the company will be able to deliver nails in Chicago at $1.50 per keg.—[Industrial World.

W. J. Burton & Co., Detroit, Mich., have just issued a new descriptive catalogue of their "Eastlake" metallic shingles, in which they direct the attention of the trade to the various products which they manufacture. Their factory appliances are among the best, which insure prompt and satisfactory results.

Hamilton Furnace, of Means, Kyle & Co., at Hanging Rock, O., was blown out on Saturday, the 14th ult., for relining and repairs. It is expected to take about three months to make these repairs. The furnace has been in blast continuously for four years and three months, and in that time has made about 90,000 tons of iron.

Robert Jones & Co., manufacturers of steam boilers, corner Pearl and Ludlow streets, Cincinnati, O., report that they are doing a very large business. Their trade covers a large territory, including many sections of the South, where they are shipping many boilers. The increase in their business is a very great improvement over past years.

The Homestead (Pa) Steel Works, of Carnegie, Phipps & Co., are to have one of the largest stationary engines in the country. It is of the Corliss pattern, and will have a horizontal cylinder, 54x72 inches. The fly-wheel will weigh 200,000 pounds. The engine will weigh a little over 500,000 pounds, and it is expected to develop 3,500 horse-power.

Medart Patent Pulley Co., factory, St. Louis, Mo., Cincinnati office 99 to 101 West Second street, are doing a very large business and having many orders for large size pulleys. They have orders enough on hand at present to keep them busy day and night for four months to come. Last week they started a night force of men in order to keep up filling the orders on their books.

The McIlvain & Spiegel Boiler & Tank Co., Southwest corner Pearl and Lawrence streets, Cincinnati, O., have orders for two boilers for the Lackman Brewing Co.; one boiler for the Gambrius Stock Co.; five boilers for the Big Sandy Packet Co., and 24 boilers for several plantations in the South. This only includes a small portion of the orders they have on their books, and they are as busy as they can be, showing encouraging increase over previous years.

The Rieslin Machine Co , No. 211 East Pearl street, Cincinnati, O., makers of Universal milling machines and drill presses, report doing a good and increasing business, and in the specialty of their patent milling machine, for which they are having many orders. This, they claim, is caused by their machine having some merits which make them superior to many others. This is only one of many firms in Cincinnati, makers of machinery, who are doing a thriving business, and show a gratifying increase in business over past years.

Wm. F. Jarvis & Co., Detroit, Mich., dealers in pig iron, write us that they have been appointed agents under A. & P. Roberts & Co., of Philadelphia, Pa., for the Beam and Channel Combination, and have taken agencies for a full line of manufacturers' supplies and railway equipment, embracing bars, boilers and tank plates, sheets, angles, forgings, heavy shafting, axles, bolts and nuts, tool and bar steel, wrought iron and steel pipe and tubes, etc. Their connections are such that they can consistently say that they are in a position to furnish the lowest prices on any specification that may be submitted to them.

A Canadian who has been making investigations in connection with the proposed establishment of the iron industry in British Columbia, visited the works of the Puget Sound Iron Co., at Irondale, Wash., recently and describes the place as follows: "The blast furnace closed a few weeks ago, after a continuous run of over fifteen months, with a stock of pig iron on hand of about 4,000 tons. The works are in prime working order under the superintendence of Mr. George Froescher, who has been the active manager for some years past. The furnace is classed at thirty tons per day. It is fifty feet high and eleven feet inside diameter at the largest part. The hot blast is furnished with sixty pipes. The blowing engine is supplied with two sets of boilers. The hoisting apparatus is wrought by a separate engine. A plentiful supply of water is brought a distance of three miles. There are also twenty kilns for converting wood into charcoal for smelting purposes. When in full blast the works give employment to about forty men. The iron ore used is from the Texaka iron mines, to which is added a very small proportion of the bog ore found in the vicinity of Irondale, but which is nearly exhausted. The pig iron is worth $35 per ton at present in San Francisco. There is an extensive wharf connected with the works, where ocean steamers can load with safety in all weathers."

The Babcock & Wilcox Co., manufacturers of water tube steam boilers, 30 Cortlandt street, New York City, write us that, though running night and day, they are several weeks behind in their orders. Since January 1st, in the Pittsburgh district alone, they have sold over 10,000 horse-power of boilers for use in iron works of various kinds. The following well-known concerns are among purchasers: Cambria Iron Co., Johnstown, Pa.; Westinghouse Air Brake Co., Wilmerding, Pa.; Latrobe Steel Works, Latrobe, Pa.; Pittsburgh Reduction Co., Pittsburgh, Pa.; Duquesne Forge Co., Rankin, Pa.; Jones & Laughlins, Limited, Pittsburgh, Pa.; Harbison & Walker, Pittsburgh, Pa.; Woodland Fire Brick Co., Clearfield Co., Pa.; Charleroi Plate Glass Co., Charleroi, Pa.; Braddock Wire Co., Rankin, Pa.; Isabella Furnace Co., Etna, Pa.; Cleveland City Cable Railway Co., Cleveland, O.; Westinghouse Machine Co., Pittsburgh, Pa.; St. Louis Wire Mill Co., St. Louis, Mo.; Hainesworth Steel Co., Pittsburgh, Pa.; Wheeling Steel Works, Wheeling, W. Va. Mr. W. C. Temple, 408 Lewis Block, Pittsburgh, Pa., is the manager for this section. They have also just issued a new edition of their book entitled "Steam," which contains 140 pages of useful information and data of great value to steam users and engineers of all kinds, and also contains the names and users of over three-quarters of a million horse-power of Babcock & Wilcox boilers, and some of their customers therein named have been using these boilers with marked success for over 20 years, and still continue to order from them invariably whenever occasion requires. The book is handsomely bound in cloth, and they would be pleased to send a copy, postage free, upon application. The Narragansett Electric Light Co., of Providence, R. I., have just contracted with the Babcock & Wilcox Co. for 1120 horse-power additional boilers, and also for the reconstruction of their present Moore boilers into the Babcock & Wilcox system.

Emery Mines in Greece.

The French Consul at Syra, in a recent report on the emery mines of Naxos, supplies the following information: Naxos emery is universally known and has a high reputation, it is the hardest and finest in the entire world. The ferruginous elements which it contains are so covered that the magnet exerts no appreciable action on it. Its composition is 80 parts aluminum, 3 parts silica, 4 iron, and 1 part not separated. According to the classification adopted by savants and among others, by M. Tennant, the plain and red Naxos emery, which contains neither gold nor silver, comes from copper mines. It is therefore superior to that met with in iron mines, and which is of a blackish color. By reason of its exceptional qualities it answers best to the needs of the arts and industries. In England and America it is used to polish gold, to cut and polish glass, marble and the hardest stones. In some countries even it is combined with gold to increase the hardness of that metal. The consumption of this metal, both in America and Europe, is estimated to be nearly 20,000 tons.

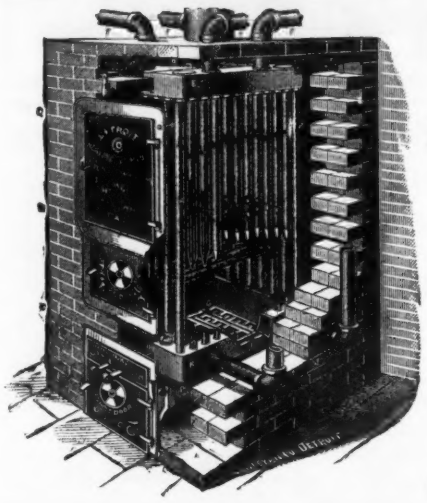
Knights of Mackabees.

Grand reunion and picnic at Oak Point Grove, Wednesday, July 23d, 1890. Excursion tickets at greatly reduced rates. Boating, fishing, bands, dancing and a jolly good time for all who go. Inquire of Nickel Plate agents.

HUNDREDS of people leave their homes, to avoid the hot weather and spend a delightful day at Niagara Falls. Nickel Plate excursion leaves 10 P. M., arrives Falls, 7 A. M.; returning, leave Niagara at 7 P. M. Home for business early Monday morning. $3 round trip. Purchase tickets at 224 Bank Street, 598 Pearl Street and depots.

CALIFORNIA will send to the World's Fair a section of one of its big trees, 33 feet in diameter, and weighing 65,000 pounds. It will take three flat cars to transport it.

BOLTON



Best for Warming Dwellings, Greenhouses, Schools, &c.
Most Economical, Durable and Easily Managed.

HOT-WATER HEATER

Safe. Clean.

BEST RECORD IN CANADA AND THE BLIZZARD NORTHWEST.

And Radiators.

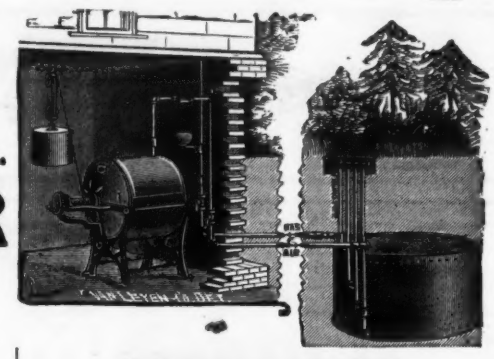
Its Vertical Circulation renders its action Prompt and Rapid.
Its Fire Surface is the largest in proportion to Grate Surface.
No Bolted, Flanged or Packed Joints; therefore cannot Leak.
Its Brick Casing entirely prevents loss of Heat in Cellar.
Wrought Iron; therefore cannot Crack.

WEBER STRAIGHTENING VALVES.

Send for Circulars.

Detroit Heating & Lighting Co.,

88 Lake St., Chicago, Ills. 396 Wight St., Detroit, Mich.



COMBINATION

Gas Machine

Best Independent Gas Apparatus

For Country and Suburban Residences, Churches, Schools, Stores, Hotels, Etc.

Over 20 Years in use, with never an Accident.

Average cost of gas, ⅓ cent per hour per burner.

USE THE

★

STAR VENTILATOR

FOR THE

VENTILATION

OF

Churches, Public Buildings, School-Houses, Theatres, Residences; Cotton, Woolen and Carpet Mills, Machine Shops, Foundries, Breweries, Stables, &c.

Upon application we will furnish a Blue-Print sketch showing detail and uses of the **STAR VENTILATOR.**

MERCHANT & CO.

PHILADELPHIA. CHICAGO.
NEW YORK. LONDON.

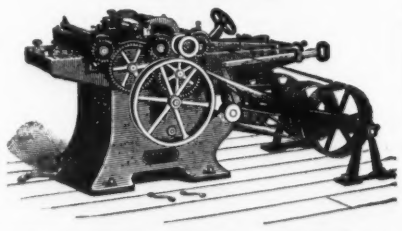
Indiana Machine Works

FORT WAYNE, IND.,

Builders of

High Grade
WOOD-WORKING MACHINERY

Of Modern Design.



CLIPPER, PLANER, MATCHER AND MOULDER.

Machinery for

PLANING MILLS,
SASH AND DOOR,
FURNITURE FACTORIES, Etc.

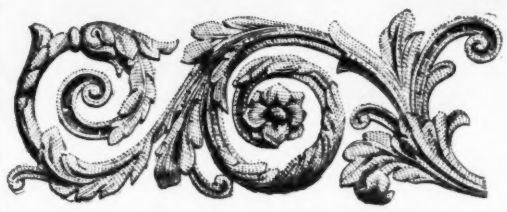
Also make a specialty of light Gray Iron Castings and Mill Supplies.

Prices and Circulars Cheerfully Furnished.

PATENTS

WM. M. MONROE,

SOLICITOR & COUNSELLOR, City Hall, Room 48.



Stamped Scrolls, Rosettes, Leaves and Ornaments

MADE OF BRASS, COPPER AND ZINC.

GALVANIZED IRON CORNICES,

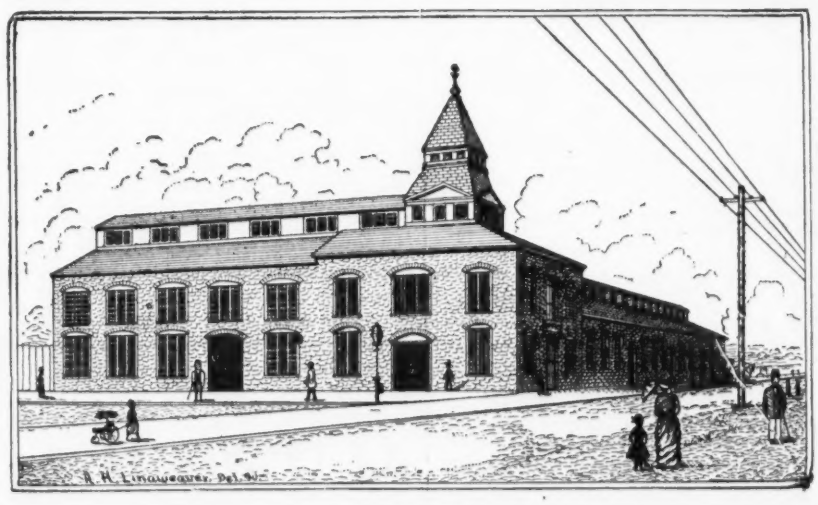
Store Fronts, Etc.

Send for advance sheets of 1890 Catalogue, also catalogue of Ornaments and Center Pieces,

W. H. MULLINS,

250 Depot St., SALEM, O.

J. T. WAGNER, Sales Agent, 108 Chamber st., New York City.



NOTICE--Master Commissioner's Sale.

DAVID RUMMELL, against THE AMERICAN NAIL & MACHINE CO., et al. } Court of Common Pleas, Hancock County, Ohio.

In pursuance of an order of sale issued from the Clerk's Office of said Court of Common Pleas of Hancock County, Ohio, on the 13th day of June, A. D. 1890, and to me directed as Special Master Commissioner, in the case above named, I will expose at Public Sale, at the front door of the Court House in the City of Findlay, Ohio, on

TUESDAY, JULY 22, A. D. 1890,

at the hour of two o'clock P. M. of said day, the following Real Estate, to wit:

Inlots numbers 7032, 7033, 7034, 7035, 7036, 7037 in the South Highlands Addition to Findlay, Ohio.

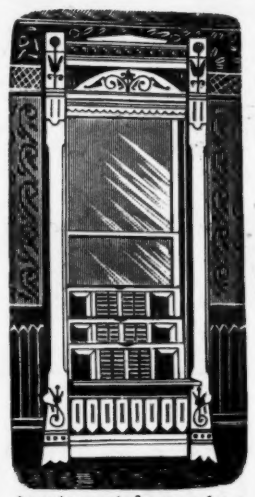
Also inlots numbers 7198, 7199, 7200, 7201, 7202, 7203 in the Burt Addition to said city, together with the Foundry, Nail and Machine Shops erected thereon, with Machinery, Engines, Boilers, Tools, Fixtures, Franchises and Privileges to the same belonging or in anywise appurtaining.

Being the property of The American Nail & Machine Co.

Appraised at $31,300. Terms of sale: Cash.

VINCENT H. COONS, Master Commissioner.

Hartman's Patent Inside Sliding Window Blind



is the most popular Blind in America. Architects & builders prefer it to any other, for **merit, style, convenience and economy.**

Not Complicated.

The **Only** Blind that is furnis'd with an automatic **Burglar-Proof Lock,** free of charge. This is an item of **immense magnitude,** and may save you many times the cost of blinds & perhaps life also, and the **only** blind that gives entire satisfaction.

Thousands are in use.

Agents wanted everywhere. Send for illustrated catalogue and prices. Manufactured by

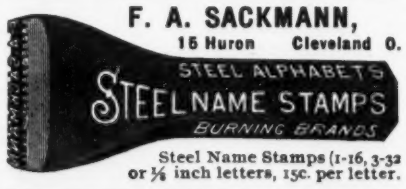
HARTMAN & DURSTINE, No. 59 Beaver St. Wooster, O.

THE COMET LAWN AND GARDEN FORCE PUMP.

Throws a CONTINUOUS stream 50 to 60 feet. Showers Lawns, Plants, Gardens, washes Carriages, Windows, etc Not a CHEAP SQUIRT GUN, but a GOOD, DURABLE PUMP with BRASS CYLINDER, HOSE and SPRAYING ATTACHMENT. Price $2. A liberal discount to the trade. Every family wants one. Send for circulars. **H. B. RUSLER,** Sole Mfr. Comet Pumps and Rubber Bucket Pumps, JOHNSTOWN, OHIO.

F. A. SACKMANN,

15 Huron Cleveland O.



Steel Name Stamps (1-16, 3-32 or ¼ inch letters, 15c. per letter.

PATENTS OSBORNE & CO., Patent Attorneys, 29 Euclid Ave., Cleveland, O. **U. S. and Foreign Patents Procured.** Patent Cases Litigated. Searches and Opinions as to Scope, Validity, Infringement and Title of Patent Send for pamphlet.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus st. Factories on Columbus, Winter and Leonard streets.

Cleveland, O., U. S. A.

E. H. JONES & CO.,

223 and 225 River St., CLEVELAND, O.

ENGINEERS AND CONTRACTORS.

Steam Plants complete, including Pumps, Heaters, Engines, Boilers, etc.

PERFORATED METALS OF EVERY DESCRIPTION BY THE HARRINGTON & KING PERFORATING CO. CHICAGO.

284 Pearl St., cor. Beekman, NEW YORK.

PUMPS

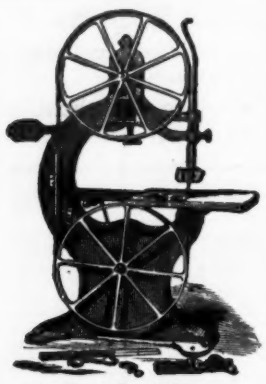
Centrifugal, Rotary and Piston Power Pumps, and House Pumps.

OVER 800 VARIETIES OF BRASS AND IRON LIFT AND FORCE PUMPS.

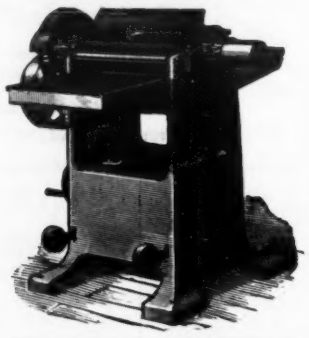
Send for Illustrated Catalogue.

RUMSEY & COMPANY, (LIMITED.)

New York City Office: 16 Dey Street. Factories: Seneca Falls, N. Y.

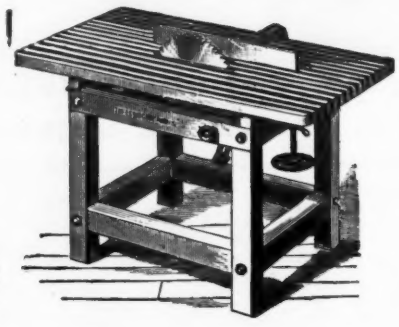


(1) No. 1 Band Saw.



Nos. 1 & 2 Planer and Smoothers. 18 and 24 inches wide.

Variety Saw.



Improved Saw Bench—Six Sizes.

ORIGINATORS — OF — Time & Labor Saving MACHINES — TO — Reduce Cost — OF — Manufacture.

Double End Wood Lathe. 16, 18, 20 and 24-inch Swing, with floor stand.

THE EGAN COM'Y,

NOS. 251 TO 271 WEST FRONT ST., CINCINNATI, OHIO, U. S. A.

Builders of the Largest Line of Late Improved WOOD-WORKING MACHINERY.

Send for Catalogue and Prices. All Machines Tested and Tried before Shipping.

Important to Iron Roofers

STANDARD V CRIMP ROLL & CAP STANDING SEAM

PORTER IRON ROOFING & CORRUGATING CO. MANUFACTURERS OF ROOFING & CORRUGATED IRON. 101 AND 103 WEST FRONT STREET

Cincinnati, O. 4/22 1890

To the Editor.
Iron Trade Review
Cleveland O.

Dear Sirs

We consider your paper an excellent medium for advertising especially for Manufacturers as we have tried same and could advertise now, but are trying another method for the present, but expect to return in the future

Yours &c
Wm. H. Porter Secty
Porter Iron Roofing Co.

SALT LAKE CITY,

ONE OF THE GREAT FIVE.

NEW YORK, CHICAGO, DENVER, SALT LAKE CITY and SAN FRANCISCO.

Midway between Denver and San Francisco, 700 miles from either, with no rivals north to British Columbia or south to Old Mexico, SALT LAKE CITY is destined to become one of the great OVER-SHADOWING COMMERCIAL CENTERS in the chain between New York and San Francisco.

The RECENT MIGHTY INFLOW of the BEST AMERICAN BLOOD has DOUBLED her population, begun the development of UNTOLD RESOURCES, built up STRONG CHURCHES of all leading denominations, created CHARMING SOCIAL CONDITIONS, fostered the public school system, DIRECTED MUNICIPAL IMPROVEMENTS and opened the MOST PROFITABLE BUSINESS INVESTMENT, MANUFACTURING and MINING OPPORTUNITIES EVER PRESENTED by a city that in three years will contain OVER 100,000 PEOPLE, and before the end of the century several times that number.

IRON DEVELOPMENT WANTED.

Utah is entering on her Iron Age. She needs and would make profitable a rolling mill and general iron manufactory on a good sized scale, costing anywhere up to $500,000 or $1,000,000. The iron ore deposits are believed to be the largest in the United States. Near Iron Springs is a deposit of millions of tons of ore which Prof. J. S. Newberry, of Columbia College, pronounces the best in this country. Averages 60 per cent. in metallic iron. Heretofore the want of coke has been the obstacle, but this year (1890) coke from our own Castle Gate coal has been successfully used, and we believe the solution of the problem is at hand. A fair assay of this ore runs: metallic iron, 62.6 per cent.; phosphorus, none; sulphur, 12 per cent.; silica, 4.8 per cent. Another: 61.53 per cent. metallic iron; phosphorus, none; sulphur, none; silica, 5.5 per cent. There is no titanic acid. Plenty of charcoal can be made close at hand. Abundance of coal near by for all purposes but coking. The coking coal does not lie so near the iron; it is hauled some distance. Near the iron deposits are extensive deposits of manganese. Deposits of limestone near by go in lime 80 per cent.

THE MARKET FOR IRON ORE AND GOODS.

Since Salt Lake City is over 700 miles from Denver and Pueblo, and 700 miles nearer San Francisco than any iron producing point, our advantage in market will be apparent. Railroad and building construction, which uses much iron, is only begun in the vast country of which Salt Lake City is the business center. Our people and our railway lines will heartily support iron development here. Salt Lake City is a great Health and Summer resort. We would like to have iron men enter into correspondence with us. It is certain Eastern iron cannot compete in this great market. Combine business with pleasure and come and see us this Summer. FOR DETAILS AND FOR ILLUSTRATED PAMPHLETS, SUMMER TOURIST RATES, etc., address,

REAL ESTATE EXCHANGE, Salt Lake City, Utah.

THE CHEAPEST

ALUMINUM,

AS WELL AS THE BEST,

Is offered to the Trade by the

Cowles Electric Smelting & Aluminum Co.,

CLEVELAND, O.

Price, $2 per pound for Aluminum contained in an alloy with copper, and $1.60 per pound when alloyed with iron, the same being subject to analysis.

—MANUFACTURERS OF—

Manganese Bronze, Aluminum and White Silver Bronze. Heavy Castings a Specialty.

Standard Fiber-Ware.

STANDARD FIBER-WARE COMPANY. STANDARD MANKATO, MINN.

Water, Dairy, Fire and Chamber Pails, Wash-Basins, Spittoons, Slop Jars, Mats, Etc., are

USED BY EVERYBODY

who knows its merits, because it is

Handsome, Cleanly, Durable,

and is made from Flax Fibre, in styles plain and decorated, white and colored, and is

SOLD BY ALL DEALERS

Who keep abreast with the times. None genuine without this trade-mark. See price list elsewhere. Send for catalogue, etc.

Engineers Don't be Deceived. The Cyclone Steam Flue Cleaner is the only Cleaner made giving steam a spiral motion the entire length of the tubes.

CRESCENT MFG CO., Cleveland, O.

NORTHERN MEN

WHO HAVE OBSERVED CAREFULLY THE DRIFT OF IRON INDUSTRIES, AND WHO CONTEMPLATE

Southern Manufacture,

Believing that where the raw material can be produced cheapest, there its varied products may be most profitably put forth, are invited to locate

AT HARRIMAN, TENN.,

THE NEWEST CITY OF THE NEW SOUTH.

Says Dr. Koenig, Professor of Metallurgy and Mining in the University of Pennsylvania: "In connection with the close proximity of the coal in Walden's Ridge, I do not hesitate to make the assertion that iron can be made here at a greater profit than in Birmingham."

Harriman already has Two Railroads—the Cincinnati Southern and the East Tennessee, Virginia & Georgia—which form a junction there; and more are coming. It has a fine river, the Emory, navigable for freighting the year round; the best drainage and splendid water supply. It is nearly 1,000 ft. above sea-level; its climate is charming; and Coal and Iron Ore fairly touch each other at the City's doors. It is

INCOMPARABLY THE BEST LOCATION

For Rolling Mills, for Car Wheel Works, for Machine Shops, for Factories of all kinds, yet secured by Northern Capital in the Southern States.

The most desirable inducements for such to locate there, are offered by

THE EAST TENNESSEE LAND COMPANY.

A $250,000 Furnace, and a Magnificent Hotel, are to be erected at once by the Company; 200 buildings are under contract for immediate erection; private enterprise is investing large amounts in various minor industries; and large portions of the admirable city site are reserved for CHEAP HOMES FOR WORKINGMEN.

To be Another Birmingham.

☞For full particulars address the Secretary.

OFFICERS AND DIRECTORS:

CLINTON B. FISK, President. JOHN HOPEWELL, JR., 1st Vice-President. A. W. WAGNALLS, Treasurer. A. A. HOPKINS, Secretary.

JAMES B. HOBBS, FERD. SCHUMACHER, WM. SILVERWOOD, WALTER C. HARRIMAN, J. R. LEESON,
E. M. GOODALL, F. W. BREED, FREDERICK GATES, PHILIP S. MASON.

TIMES BUILDING, - - - NEW YORK CITY.

NEW ILLUSTRATED

Catalogue

NOW READY.

Contains a great variety of new machines, and all the latest improvements on our regular manufactures.

MILLING MACHINES,

SCREW MACHINES, Etc.

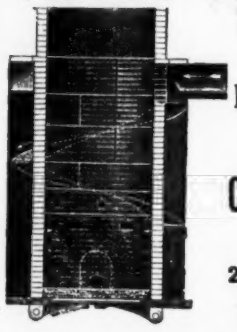
—THE—

Garvin Machine Co.

Laight & Canal Sts.,

New York.

VICTOR COLLIAU,



Sole Manufacturer OF THE

Improved Patent HOT BLAST

Colliau Cupola

ADDRESS:

287 Jefferson Ave.

DETROIT, MICH.

JOHN ADT & SON,

New Haven, Conn.,

Builders of Machinery for Hardware Manufacture,

AUTOMATIC

Wire Straightening and Cutting Machines,

Butt Milling Machinery, Butt Drilling Machinery Riveting Machines, Drilling and Countersinking Machines, Foot Presses, Sprue Cutters, Etc.

INDUSTRY FILE WORKS,

A. & H. Gough, Props.,

Manufacturers of

Files and Rasps,

Equal to the Best English File.

OLD FILES RE-CUT.

All Kinds of Job Grinding.

OFFICE & WORKS,

48 COLUMBUS ST.,

CLEVELAND, O.

C. GOUGH Manager.

Mention this paper.

SHEPARD'S NEW $60

SCREW CUTTING

Foot Lathe

Foot & Power Lathes, Drill Presses, Scroll-Saw Attachm'ts, Mandrels, Chucks, Twist Drills, Dogs, Calipers etc. Lathes on trial Lathes on payment

Send for catalogue of Outfits for Amateurs or Artisans. Address H. L. SHEPARD, Agt., 124 East Second St., Cincinnati, O.

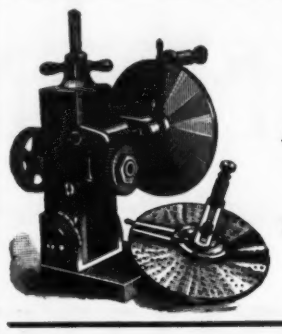
S. T. W. Ejector.

For Raising Water from Deep Wells, Streams, Excavations, &c.

The cheapest made. Send for prices.

JAMES JENKS,

Detroit, Mich.



Palmer's Gear Cutting Attachment

CAN BE USED ON ANY SCREW-CUTTING LATHE FOR

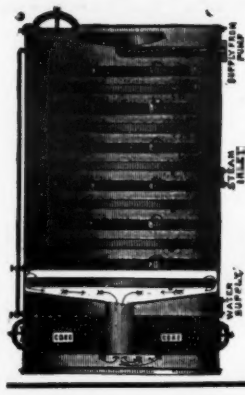
Amateurs, Clock Makers, Model Makers, Knitting Machine Makers, Tool Makers,

Or any one having use for SMALL GEARING.

For particulars, address

PALMER, CUNNINGHAM & CO., L't'd,

607 Market St., PHILADELPHIA, PA.



THE MEYER'S ORIGINAL

Live Steam Feed Water Heater,

LIME EXTRACTER AND PURIFIER.

Does away with boiler repairs. Keeps boilers free from scale. All steam users need them.

For information apply to

COX & MORRISON,

Wheeling Boiler Works,

Wheeling, W. Va.

G. W. STOCKLY, President. J. J. TRACY, Vice-President. W. F. SWIFT, Secretary.
J. POTTER, Treasurer. N. S. POSSONS, Supt. W. J. POSSONS, Asst. Supt.
S. M. HAMILL, Jr., Assistant Secretary.

THE BRUSH ELECTRIC CO.,

Sole Manufacturers under all the

PATENTS OF CHARLES F. BRUSH, FOR ELECTRIC LIGHTING, STORAGE BATTERIES, CARBONS, ELECTRO-PLATING MACHINES, ELECTRO MOTORS, ETC.

The Brush Light Still Leads the Field.

No other System in the World equals ours in Simplicity, Durability, Earning Capacity, Reliability. The Best is always the Cheapest.
45,000 Brush Arc Lamps now in use. Self-Regulating Incandescent Apparatus.

GET OUR AGENT TO MAKE PLANS FOR YOU BEFORE BUYING ELSEWHERE.

THE BRUSH ELECTRIC CO.,

CLEVELAND, OHIO, U. S. A.

Agencies Everywhere.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g,
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

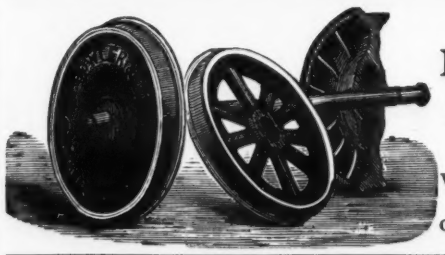
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and cheapest Paint made.

FURNISHED both Dry and Ground in Oil.

USED BY NEARLY ALL THE RAILROADS



CLEVELAND FOUNDRY.

HEAVY CASTINGS.

ARCHITECTURAL WORK in all its branches.

Car Wheels

With or without axles, Street Railroad Wheels and Track Supplies.

Office 14 Winter St. CLEVELAND, O. } BOWLER & CO.

DAY'S

Instantaneous Heater

—AND—

BATH TUB COMBINED.

The only Portable Folding Bath Tub made. Can be stored in space 2½x2½x6 feet.

Can be moved from bath room to sick-room.

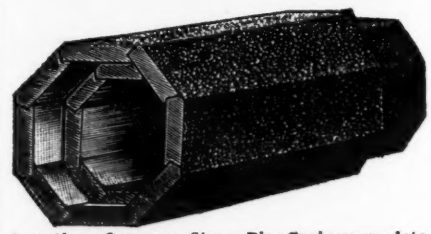
Write for catalogue and discounts.

Made by The DAY MFG. CO., Detroit, Mich.

STRONG, WELL BUILT, SERVICEABLE

STEAM ENGINES

Adapted to HEAVY, CONTINUOUS WORK.
EVERY ENGINE TESTED UNDER FULL LOAD.
FOR DESCRIPTIVE CIRCULARS ADDRESS
CHANDLER & TAYLOR CO. INDIANAPOLIS, IND.



A section of our new Steam Pipe Casing complete.

A. WYCKOFF & SON,

Elmira, N. Y.

Patent Steam Pipe Casing

For Underground Steam Pipes.

Send for Circular and Prices.

Two staves removed to show the lining between the inside and outside staves.

UNIVERSAL RADIAL

RADIAL DRILLING MACHINES

THREE DESIGNS, SIX SIZES.
EMBODY ALL DESIRABLE FEATURES
PRICES $450.00 & UPWARD

ADDRESS UNIVERSAL RADIAL DRILL CO
CINCINNATI, O. U.S.A.

Steam Jet Pumps,	From	$4.00 up.
Automatic Injectors,	"	$5.00 up.
High Lifting Injectors,	"	$6.00 up.
Shafting, Hangers,	"	$1.00 up.

COUPLINGS, BOXES, COLLARS, ETC.

Write for Circulars, Etc.

COLUMBIA INJECTOR CO., CLEVELAND, O.

THE SWEET & CLARK CO., Marion, Ind.

Manufacturers of REFINED AIR FURNACE MALLEABLE IRON.

Superior advantages on account of Natural Gas Fuel. Also manufacturers of Curry-Combs, Hardware and Saddlery Hardware Specialties. ☞Write for Price List and Catalogue.

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash): Bessemer, $19 20; No. 1 Foundry, $17 80; No. 2 Foundry, $16 80; No. 1 Gray Forge, red short, $15 80; No. 2 Gray Forge, neutral, $15 30; No. 1 American Scotch, $17 80; No. 2 American Scotch, $16 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 00 @16 50; Southern Coke No. 2 Foundry, $15 50 @16 00; Southern Coke No. 3 Foundry, $15 00 @15 50; Southern Coke No 1, Softeners, $15 50 @16 00; Southern Coke No. 2, Softeners, $15 00 @15 50; Ohio Silveries No. 1, $18 25@18 75; Ohio Silveries No. 2, $17 25@ 17 75; Ohio Strong Softeners No. 1, $19 00@19 50; Ohio Strong Softeners No. 2, $18 25@18 75; Lake Superior Charcoal Nos. 1 to 6, $20 50@21 00; Tennessee Charcoal No. 1, $19 50@20 00; Tennessee Charcoal No. 2, $19 00@19 50; Southern Standard Car Wheel, $24 00@25 00; Tennessee Standard Car Wheel, $20 00@20 50; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $23 00@25 00; Old Car Wheels, $00 00@00 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $14 75@15 25; Southern Coke No. 2 Foundry (new classification), $14 25@ 14 75; Southern Coke No. 3 Foundry (new classification), $13 75@14 25; Grey Forge, $13 25@13 75; White and Mottled, different grades, $12 25@12 50; Silver Grey, different grades, $14 00@15 00; Southern Charcoal No. 1 Foundry, $17 50@18 50; Southern Charcoal No. 1 Mill, $15 75@16 75; Southern Car Wheel, Standard brands, $22 50@23 50; Southern Car Wheel, other brands, $18 50@21 00; Hanging Rock Coke No. 1 Foundry, $00 00@00 00; Hanging Rock Charcoal No. 1 Foundry, $00 00@ 00 00; Hanging Rock Cold Blast, $00 00@00 00; Hanging Rock Warm Blast, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 50@16 00; Hanging Rock Coke, No. 1 foundry, $17 50@18 50; Jackson Co. Stone Coal, No. 1 foundry, $17 00@17 50; Tennessee Charcoal, No. 1 foundry, $17 50@18 00; Hanging Rock Charcoal, No. 1 foundry, $21 00 @22 00. MILL IRONS—Standard Southern Coke, grey forge, $13 50@14 00; Standard Southern Coke, mottled, $13 00@13 50; Cold Short Southern Coke, grey forge, $13 00@13 50; Strong Ohio Neutral Coke, grey forge, $16 00@16 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $22 50@23 00; Tennessee Car Wheel, $20 50@21 50; Lake Superior Car Wheel, $21 50@22 50.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $15 50@15 75; Southern coke No. 2, $14 75@15 25; Southern coke No. 3, $14 25@14 50; Mahoning Valley (Lake ore mixtures), $17 75@18 75; Southern charcoal, No. 1, $17 00@17 50; Southern charcoal, No. 2, $16 50@17 00; Missouri charcoal, No. 1, $18 00@18 50; Missouri char coal, No. 2, $17 00@17 50. FORGE—Neutral coke $13 75@14 25; Cold short, $13 75@14 00; Mottled, $12 75@13 75. CAR WHEEL AND MALLEABLE—Southern (standard brands), $22 00@ 23 00; Southern (other brands), $18 00@19 00; Lake Superior, $22 50@23 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 25@16 50; Southern Coke No. 2, $15 25@15 50; Southern Coke No. 3, $14 75@15 00; Southern Grey Forge, $14 25@ 14 50; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $17 00@17 50; Missouri Charcoal No. 2, $16 25@16 75; Ohio Softeners, $18 00@ 19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $22 00@22 50; Southern, $19 00@ 22 50. CONNELLSVILLE COKE—East St. Louis, $5 65; St. Louis, $5 80.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $18 50@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $17 50 @00 00; Niagara No. 1, $00 00@00 00; Niagara No. 2, $00 00@00 00; Niagara No. 3, $00 00@00 00; Ohio Softener No. 1, $18 50@00 00; Ohio Softener No. 2, $17 50@00 00; Lake Superior Charcoal, $20 00@00 00; Tennessee Charcoal, $19 50@00 00; Southern Softener No. 1, $16 75@00 00; Southern Softener No. 2, $15 75@00 00; Southern Strong No. 1 Foundry, $17 75@00 00; Southern Strong No. 2 Foundry, $16 75@00 00; Alabama Car Wheel, $24 75@00 00; Hanging Rock Charcoal, $23 00@24 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $20 50@21 00; Lake Superior (coke) Bessemer, $20 00@21 00; Katahdin (Maine charcoal), $24 00 @25 00; Lake Superior Coke, Foundry, all ore, $19 25@20 75; Lake Superior Coke, Foundry Cinder Mixed, $18 00@19 00; Standard Ohio Black Band, $18 75@19 25; Southern No. 1, $17 00@17 50; Southern Gray Forge, $15 25@ 15 50; Jackson County (Ohio) Silvery, $19 00@ 19 50; Old Car Wheel, $20 00@00 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 50@17 75; No. 2 Foundry, $16 50@16 75; Grey Forge, $15 50@16 00; White and Mottled, $14 50@15 00; Warm Blast Charcoal, $19 00@22 00; Cold Blast Charcoal $23 00 @29 00; Bessemer, $19 25@19 75.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 85
4½ to 6 by ⅜ to 1 inch	1 95
1¾ to 6 by 1¼ to 2 inch	2 25
1¼ & 1¾ by ⅜ to ¾ inch	1 95
1 & 1¼ by ⅜ to ¾ inch	2 05
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 25

Round and Square.

1 to 1⅜ inch	1 85
2 to 2¾ inch	2 05
2¾ to 3¼ inch	2 35
3¾ to 4 inch	2 85
4¼ to 4½ inch	3 35
4¾ to 5 inch	3 55

Oval.

⅜ to 1¼ inch	2 25
⅜ to ¾ inch	2 45
½	2 65
⅝	3 05

Half Oval and Half Round.

1¼ to 3 inch	2 95
⅜ to 1¼ inch	2 55
⅜ to ¾ inch	3 15
½	3 35
⅝	4 85

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 05
1 to 1¾ by ¼ and 5-16 inch	2 15
¾ to ⅞ by ¼ and 5-16 inch	2 35
¼ to ⅝ by ¼ and 5-16 inch	2 85

Hoops.

1¼ to 4, Nos. 13 to 15	2 65
1¼ to 2, Nos. 16 to 18	2 75
1¼ to 2, No. 19	2 85
1¼ to 2, No. 20	2 95
1¼ to 2, No. 21	3 05
1¼ to 2, No. 22	3 15
15-16, 1 and 1⅛, Nos. 13 to 15	2 85
15-16, 1 and 1⅛, Nos. 16 to 18	2 95
15-16, 1 and 1⅛, Nos. 19 and 20	3 05
15-16, 1 and 1⅛, No. 21	3 15
15-16, 1 and 1⅛, No. 22	3 25
¾, Nos. 13 to 15	3 05
¾, Nos. 16 to 18	3 15
¾, Nos. 19 and 20	3 25
¾, No. 21	3 35
¾, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
⅝, Nos. 13 to 15	3 35
⅝, Nos. 16 to 18	3 55
⅝, Nos. 19 and 20	3 65
⅝, No. 21	3 75
⅝, No. 22	3 85
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 75
11-16, Nos. 19 and 20	3 85
11-16, No. 21	3 95
11-16, No. 22	4 05
½, Nos. 13 to 15	3 85
½, Nos. 16 to 18	4 05
½, Nos. 19 and 20	4 15
½, No. 21	4 25
½, No. 22	4 35
½, No. 23	4 55

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 25
1¼ to 6 by Nos. 11 and 12	2 35
1 to 1¾ by ⅛ to 3-16 in	2 45
1 to 1¾ by Nos. 11 and 12	2 55
⅞ and 13-16 by ⅛ to 3-16 in	2 75
⅞ and 13-16 by Nos. 11 and 12	2 85
¾ and 11-16 by ⅛ to 3-16 in	3 05
¾ and 11-16 by Nos. 11 and 12	3 15
⅝ and 9-16 by ⅛ to 3-16 in	3 35
⅝ and 9-16 by Nos. 11 and 12	3 45
½ by ⅛ to 3-16 in	3 65
½ by Nos. 11 and 12	3 75

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 85
⅛ inch, " " " 13 and 14	3 05
¼ inch, " " " 11 and 12	3 15
¼ inch, " " " 13 and 14	3 35

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 80
No. 18 to 21	3 00
No. 22 to 24	3 20
No. 25 to 26	3 35
No. 27	3 45
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	3 00
Shell	3 40
Flange	3 70
Marine Flange	4 10
Fire Box	4 80

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6¼ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	0

Bessemer and O. H. Steel.

Machinery	base price,	3 00
Tire	"	3 00
Spring	"	3 50
Sleigh Shoe	"	3 00
Toe Calk	"	3 25
Cutter Shoes, tapered and burr.	"	3 25

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ⅜, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$19 50
No. 1 wrought scrap	17 00
No. 1 Machine cast scrap	13 50
Iron axles	22 00
Axle turnings	13 50
Wrought turning (free from cast)	12 00
Cast borings	9 00
Uncut wrought iron boilers	13 00
Steel boiler plates	17 00
Grate Bars	9 00
Pipes and flues (Clean)	13 00
Tank iron	13 00
Hoop and band iron	9 00
Sheet iron	10 00
Wrought drillings	11 00
Malleable iron	10 00
	GROSS TONS
Old iron T rails	24 00
Old steel rails	19 50
Old car wheels	18 50
Old copper	⅜ ℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

H. N. HILL & CO.

Manufacturers' Agents' for

BOILER TUBES.
PLATE STEEL.
BOILER RIVETS.
NORWAY IRON RIVETS.
SMOKE STACK AND GASOMETER RIVETS.
BAR IRON.
BAR STEEL.
STEEL AND IRON ANGLES.
SHEET IRON.
SHEET STEEL.
RAILROAD AND BOAT SPIKES.
WROUGHT IRON PIPE AND FITTINGS.
PULLEYS, HANGERS AND COUPLINGS.
BEAMS AND CHANNELS.
STEEL RAILS AND CASTINGS.
GALVANIZED SHEET.
PORTABLE FORGES.
RAILROAD AND MACHISTS' SUPPLIES.

813 PERRY-PAYNE BUILDING,

Telephone 95. CLEVELAND, O.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 29 Mercantile Bank Building, CLEVELAND, OHIO.

Lake Shipping Point, Lorain O.

IAS. PATTERSON, Sales Agent

Keep a Record of Your Insurance

By ordering one of our Improved

Expiration Registers.

Blanks for all the essential points of each policy.

ONLY 50 CENTS (Postage paid).

Will last for years. Sample leaves sent on application. Address

The Cleveland Printing & Publishing Co.,

Cor. Wood and St. Clair Sts.,

CLEVELAND, O.

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron,

Rooms 716, 717, 718, 719 Perry-Payne Bld'g, CLEVELAND, O.

OGLEBAY, NORTON & CO.,

Successors to Tuttle, Oglebay & Co.,

Commission Dealers in

Iron - Ores.

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore,

Perry-Payne B'ld'g, Cleveland, O.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, OHIO.

Pickands, Mather & Co.,

IRON ORE - -

—AND—

- - PIG IRON

Corner Bank and Superior Streets, CLEVELAND, O.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

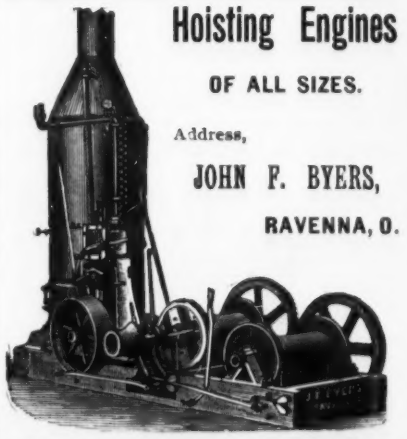
FOREST CITY Machine Works.

Wrought Iron Chaplets and Chaplet Stems.

LARGE HEAD RIVETS for stacks, Gasometers, Etc.

Works: 40, 42 and 44 Columbus St., and 37 Winter St., CLEVELAND, OHIO.

MANUFACTURERS OF



Hoisting Engines

OF ALL SIZES.

Address,

JOHN F. BYERS,

RAVENNA, O.

INDIANA MACHINE WORKS

FORT WAYNE INDIANA

BUILDERS OF

WOOD WORKING MACHINERY

WRITE FOR DESCRIPTIVE CIRCULARS

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9¾

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shultz Raw Hide Leather Belting, single.....dis 40
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¾@10½

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill .....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1½".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50 35&5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3¼
Hexagon	15⅝	11¼	8⅝	6	5¼	5¼	5
Washers	9	8	7	5	4½	4⅜	4¼

In lots less than 100 lbs, ₩ lb add ¼c., 1lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 77@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12@24
Vulcanized Rubber.....₩ lb 24

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¾

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11¾c	
3-Ply " 1lb Balls	12@12¾c	
3-Ply " 1½ lb Balls	11@11¾c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

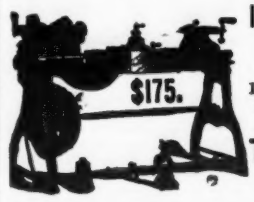
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " ".....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

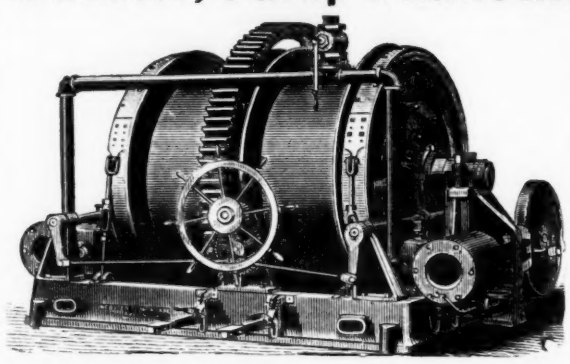


Improved Screw Cutting FOOT AND POWER LATHES

Drill Presses, Shapers, Band, Circular and Scroll Saws. Machinists' Tools and Supplies. Lathes on trial. Catalogue mailed on application.

THE SEBASTIAN-MAY CO.,
164 West Second St., CINCINNATI. O.

Webster, Camp & Lane Machine Co.



MANUFACTURERS OF
Mining Machinery,
Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.
Wire Rope Haulage Machinery,
Endless or Tail Rope Systems.)
CORNISH PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.

Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

THE THOS. D. WEST FOUNDRY, CO.
CLEVELAND, O.
LIGHT AND HEAVY
IRON CASTINGS.
DAILY MELTING CAPACITY 75 TONS—SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.
DUPLICATE WORK A SPECIALTY

THOS. MEIKLE, Pres't L. E. HOFFMAN, Sec'y. A. A. PARKER, Treas. D. A. STEWART, Sup't.
Ohio Heating, Plumbing & M'fg. Co.,
MANUFACTURERS AND JOBBERS OF
MALLEABLE AND CAST IRON FITTINGS, BRASS GOODS,
Tools and Supplies. Plumbers, Gas and Steam Fitters.
TELEPHONE 2260. 99 and 101 Water St. CLEVELAND, O.

Detachable and Roller
CHAIN BELTING,

MADE IN ALL SIZES OF
Malleable Iron and Steel,
DESIGNED FOR
Elevators, Conveyors, Drive Belts, etc.
For handling materials of all kinds.
Send for 1890 Illustrated Catalogue. Address
The Jeffrey M'f'g Co.,
183 East 1st Ave.,
COLUMBUS, O.

PRICE $35.00.

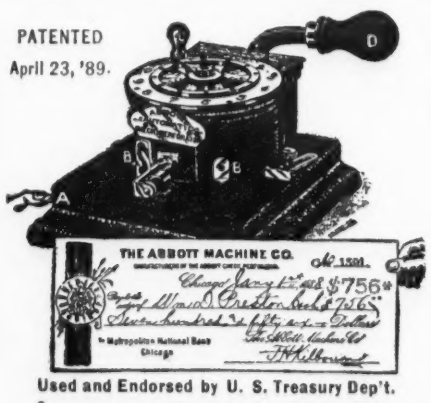
It is the best wheel for boys, no doubt about it. There were several good ones; one of them best; the new one beats that. Our Little Giant is the new one, therefore the best. But the No. 4 with ball bearings all around beats that.

CATALOGUE FREE, SEND FOR ONE AND BE CONVINCED.

Lozier & Yost Bicycle Manufacturing Co.,
TOLEDO, OHIO.

FRANKLIN
TYPE
And ELECTROTYPE FOUNDRY,
168 VINE STREET, CINCINNATI, OHIO.
The type on which this paper is printed is from the above foundry.—ED. REVIEW.

PATENTED
April 23, '89.



Used and Endorsed by U. S. Treasury Dep't.

$1234567890

THE ABBOTT
CHECK PERFORATOR
For perforating the original amount in Checks. Should be used in the office of every person, company or corporation who have a bank account.
Investigate and learn the risk you assume by not using it.
PRICE, - $30.00.
ABBOTT MACHINE CO.,
47 and 49 South Canal St.,
CHICAGO, ILL.
Pittsburgh Office:
531 Wood St.
All kinds of perforating stamps made to order.

OIL ALWAYS BELOW BURNERS---BY USING OUR SYSTEM.
OUR SYSTEM IS INSURABLE IN ALL INSURANCE COMPANIES.
WE GUARANTEE INSURANCE WHEN PLANT IS INSTALLED ACCORDING TO OUR SPECIFICATIONS.

THE AERATED FUEL CO.,

425 MAIN STREET, SPRINGFIELD, MASS.
FORGING, WELDING, BRAZING, MELTING, ANNEALING, HARDENING, TEMPERING.
THE GILBERT & BARKER MFG. CO., Springfield, New York and Boston, General Agents for U. S.
Represented by { W. S. COLLINS, 171 BROADWAY (SUITE 24), NEW YORK. / WM. PICKETT, SON & CO., 170 LAKE ST. CHICAGO, ILL. / C. S. BARROWS, 6 WADE BLDG., CLEVELAND, O. Also for Michigan and Indiana. / CHILION JONES, GANANOQUE, ONTARIO. / G. M. SMITH, LOS ANGELES, CAL.
SEND FOR CATALOGUES.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩ doz $8 00
Others.....₩ doz $7 00
Full polished.....₩ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&7½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&5
Loose joint, jap.....dis 70&5
Loose joint, jap. with acorns.....dis 7c&5
Loose pin, acorns.....dis 70&5
Loose pin, japanned acorns.....dis 7c&5
Loose pin, acorns, jap. plated tips.....dis 70&5
Wrought steel—
Wrought, fast joint, narrow.....dis 70&5
Wrought, fast joint, broad.....dis 7c&5
Wrought, loose joint, broad.....dis 7c&5
Table Butts, back flaps, etc.....dis 70&5
Regular inside blind.....dis 7c&5
Light inside blind.....dis 70&5
Loose pin.....dis 70&5
Light loose pin.....dis 7c&5

Chains.

Revised List.

Trace, 6¾-10-2.....₩ pair 1.03
Trace, 6¾-10-3.....₩ pair .92 } .....50&10
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....₩ 05¼@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch	4 00	4 50	5 00
10 and 11¼ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 50&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ₩ M.	23	24	25	26	28	dis 25&10
Putnam, ₩ M.	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze.....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....₩ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 00
Bishop's O K.....₩ doz $5 25
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....₩ gross $15 00

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

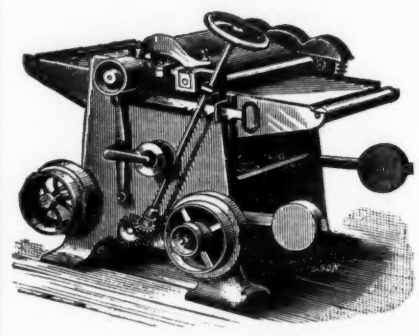
Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds dis 70&10&10
Steel carpet tacks all kinds.....dis 70&10&10
Swedes iron carpet tacks, all kinds dis 70&10&10
Swedes iron tacks.....dis 70&10&10
Swedes iron Upholsterers' tacks..dis 70&10&10
Tinned Swedes iron tacks.....dis 70&10@10
Tinned Swedes iron Upholsterers' tacks.....dis 70&10&10
American iron cut tacks.....dis 67½&10&10
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 65
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10&10
Basket nails.....dis 66&10&10
Chair nails.....dis 66&10&10
Common and patent brads.....dis 66&10&10

Improved Wood-Working Machinery.



A FULL LINE
LOW PRICES.
Planing, Matching, Molding, Tenoning, Mortising, Boring, Shaping, Carving, Etc.
Complete Outfits.

Write for our New Illustrated Catalogue (just out) and our Latest Price List. Mention this paper.
FRANK & CO., 176 Terrace Street, BUFFALO, N. Y.

HOMOG-ENEOUS TRADE "NEVER BREAK" STEEL MARK SPIDER

The Bronson Supply Co.,
CLEVELAND, O., U. S. A.
Exclusive Manufacturers
Nos. 7, 8, 9, 10 and 12.
Will not absorb Grease; will not impart the Flavor of previously Cooked Food; Easily kept clean.
BETTER THAN ENAMEL,
Because They Will Not Scale.

LEADER STEEL BARROW, NO. 6.

Write for Catalogue of all styles of Steel and Wood Barrows, Hand Carts and Warehouse Trucks.
LANSING WHEELBARROW CO.
LANSING, MICH.

HERE IS YOUR CHANCE.

Can any one make better club rates than the following?

						Per Year.
Scribner's,	Monthly,	with	IRON	TRADE	REVIEW,	$4.50
Century,	"	"	"	"	"	5.50
Cosmopolitan,	"	"	"	"	"	3.50
St. Nicholas,	"	"	"	"	"	4.50
Frank Leslie's Popular,	"	"	"	"	"	4.50
Frank Leslie's Budget of Wit,	"	"	"	"	"	4.00
Frank Leslie's Pleasant Hours,	"	"	"	"	"	3.50
Outing,	"	"	"	"	"	4.25
Life,	Weekly,	"	"	"	"	5.75
Texas Siftings,	"	"	"	"	"	3.00

Send your subscriptions to the
CLEVELAND PRINTING & PUBLISHING CO., Cleveland, Ohio.

Classified List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks.

PAGE.

Aluminum—
Cowles Electric Smelting & Aluminum Co., Cleveland 14

Bath Tubs—
*Michigan Bath Tub Co., Homer, Mich. .... —
‡Instantanous Water Heating Co., Chicago, Ill. .... —
Day Mfg. Co., Detroit, Mich* 16

Blowers—
Buffalo Forge Co., Buffalo, N. Y. 22

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland 20

Belt Holders—
*W. R. Santley & Co., Wellington, O. 22

Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York 24
J. C. McNeil & Co., Akron, O. 20
Columbia Injector Co., Cleveland 16
Penberthy Injector Co., Detroit, Mich. 24
Wm. B. Pollock & Co., Youngstown, O. 22
Alliance Steam Boiler Works, Alliance, O 20

Bicycles—
Lozier & Yost, Toledo, O. 18

Chaplets—
Forest City Machine Works, Cleveland 17

Check Perforators—
Abbott Machine Co., Chicago, Ill. 18

Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland 17

Cornice Work—
W. H. Mullins, Salem, O. 13

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O. 22

Car Wheels—
Bowler & Co., Cleveland 16

Chain Belting—
Jeffrey Mfg. Co., Columbus, O. 18

Damper Regulators—
*Curtis Regulator Co., Boston, Mass. .... —

Die Makers.
Avery Stamping Co., Cleveland 16

Door Hangers—
Taylor and Boggis Fdy. Co., Cleveland 24

Drilling Machines—
Universal Radial Drill Co., Cincinnati, O. 16
W. F. & John Barnes' Co., Rockford, Ills. 22

Dry Kilns—
*Akron Heating & Ventilating Co., Akron, O. .... —

Engineers and Contractors—
E. H. Jones & Co., Cleveland 13

Elevators—
L. S. Graves & Co., Rochester, N. Y. 22

Explosives—
Hercules Powder Co., Cleveland 22

Electrical Manufactures—
†Cleveland Electrical Mfg. Co., Cleveland —
Brush Electric Co., Cleveland 16

Elevator Buckets.
Avery Stamping Co., Cleveland 16

Emery Wheel Dressers—
W. W. Brisben, Cleveland 24

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill. 24
W. F. & John Barnes' Co., Rockford, Ill. 22

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland 21
Union Electrotype Foundry, Cleveland. 20

Engines (Steam)
E. H. Jones & Co., Cleveland 13
*Chandler & Taylor Co., Indianapolis, Ind. 16
Jas. Leffel & Co., Springfield, O. 22
Wm Tod & Co., Youngstown, O. 22
Skinner Engine Co., Erie, Pa. 22
Aetna Machine Co., Warren, O. 22
C. H. Presley & Co., Cleveland 20

Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill. 23
Van Duzen Gas Engine Co., Cincinnati, O. 21

Engines (Hoisting)—
John F. Byers, Ravenna, O. 17

Engines (Oil)
C. H. Presley & Co., Cleveland, O. 20

Engineers' Specialties—
Crescent Manufacturing Co., Cleveland. 14
*Curtis Regulator Co., Boston, Mass. .... —
Standard Regulator Co., Buffalo, N. Y. 23

Ejectors—
James Jenks, Detroit, Mich. 16

Flue Cleaners—
Crescent Manufacturing Co., Cleveland . 14
†Butman Furnace Co., Chicago, Ill. .... —

Fiber-Ware—
Standard Fiber-Ware Co., Mankato, Minn 13

Files, Makers of—
Reynolds Bros., Columbus, O. 24
A. & H. Gough, Cleveland 16

Forges—
Buffalo Forge Co., Buffalo, N. Y. 22
Cleveland City Forge & Iron Co., Cleveland 23

For Sale—
Foundries, Furnaces, Machinery, etc. 20

Foundries—
Bowler & Co., Cleveland .... 16 & 20
Curry & Co., Meadville, Pa. 20
Thos. D. West. Foundry Co., Cleveland. 19

Foundry Cupolas—
Victor Colliau, Detroit, Mich. 19

Feed Water Heaters—
Stilwell & Bierce Manufacturing Co., Dayton, O. 24
Laidlaw & Dunn Co., Cincinnati, O. 22
Armstrong Bros., Springfield, O. 22
E. H. Jones & Co., Cleveland 13
Cox & Morrison, Wheeling, W. Va 16

Frost Proof Steam Traps—
*Curtis Regulator Co., Boston, Mass. .... —

Galvanizers.
Avery Stamping Co., Cleveland 16

Gas Machines—
Detroit Heating & Lighting Co., Detroit, Mich 13

Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa. 16

Hardware—
Bronson Supply Co., Cleveland 19

Hose—
Fabric Fire Hose Co., New York 22

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O. 23
Cambridge Iron Roofing Co., Cambridge, Ohio 23
Garry Iron Roofing Co., Cleveland 23
Standard Iron Co., Bridgeport, O. 23
Thompson Manufacturing Co., Cleveland, 23
W. J. Burton & Co., Detroit, Mich. 23
Berger Mfg. Co., Canton, O. 23
Holton Iron Roofing Co., New Lisbon, O. 23
*Merchant & Co., Philadelphia Pa. 11

Iron (Malleable)—
Sweet & Clark Co., Marion, Ind. 17

Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland. 17
Oglebay, Norton & Co., Cleveland 17
J. H. Outhwaite & Co., Cleveland. 17
Condit-Fuller Co., Cleveland, O. 17
Pickands, Mather & Co., Cleveland. .... 17 & 20
H. N. Hill & Co., Cleveland 17
E. C. Pope, Cleveland 17

Lathes—
Sebastian, May & Co., Cincinnati, O. 18
H. L. Shepard, Cincinnati, O. 16

Manufacturing Sites—
Chas. G. Eddy, Norfolk, Va. 21
East Tennessee Land Co., New York 15
*Real Estate Exchange, Salt Lake City, Utah 14

Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O. 18
*Copeland & Bacon, New York .... —

Machinery (Foot Power)
W. F. & John Barnes' Co., Rockford, Ill. 22

Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O. 20

Machinists' Tools and Supplies—
Parkin & Bosworth, Cleveland .... 20 & 24
Garvin Machine Co., New York 13
C. H. Presley & Co., Cleveland, O. 20

Master Commissioner's Sale—
Vincent H. Coons, Findlay, O. 13

Office Furniture—
D. P. Fish, Cleveland 21

Oil Fuel Process—
Aerated Fuel Co., Springfield Mass. 19

Patents—
Osborne & Co., Cleveland 13
Wm. M. Monroe, Cleveland 13

Plumbers and Steam Fitters—
Ohio Heating, Plumbing & Mnfg. Co., Cleveland 18

Pumps (Lawn)—
H. B. Rusler, Johnstown, O. 13

Pumps (Steam)—
E. H. Jones & Co., Cleveland 13
Laidlaw & Dunn Co., Cincinnati, O. 22
Rumsey & Co., Seneca Falls, N. Y. 14
Van Duzen & Tift, Cincinnati, O. 16

Pipe Coverings—
A. Wyckoff & Son, Elmira, N. Y. 16

Planers—
Parkin & Bosworth, Cleveland 24

Printing Inks—
Ault & Wiborg, Cincinnati, O. 20

Paint—
Iron Clad Paint Co., Cleveland, O. 16
Nubian Iron Enamel Co., Chicago, Ill. 23

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill. 12

Rolled Steel—
Wilmot & Hobbs Mfg. Co., Bridgeport, Conn. 24

Rolls and Pinions—
Tottten & Hogg Iron & Steel Foundry Co., Pittsburgh, Pa. 24

Railroads—
Time Tables, Etc. 21

Railway Supplies—
Bowler & Co., Cleveland 16
Cleveland City Forge & Iron Co., Cleveland 23

Rivets—
Forest City Machine Works, Cleveland. 17

Roofing—
*Merchant & Co., Philadelphia, Pa. 13
S. E. Barrett Mfg. Co., Chicago, Ill. 12

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland. 17

Saws—
Peter Gerlach & Co., Cleveland 13

Second-Hand Machinery—
D. K. Norton & Son., Cincinnati, O. 20

Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass. .... —
Detroit Heating & Lighting Co., Detroit, Mich 13

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn. 20

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland. 20
F. A. Sackman, Cleveland, O. 13

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland. 17

Sheet Steel—
Standard Iron Co., Bridgeport, O. 23

Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa. 23

Stampers of Sheet Metal—
Avery Stamping Co., Cleveland 16

Tinning Steel, Etc.
Avery Stamping Co., Cleveland 16

Twist Drills—
Cleveland Twist Drill Co., Cleveland. 24

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland 23
Central Iron & Steel Co., Brazil, Ind. 23

Tackle Blocks—
Fulton Iron & Engine Works, Detroit, Mich. 24

Type Founders—
Franklin Type Foundry, Cincinnati, O. 18

Wheelbarrows and Trucks—
Grant McNeil, Akron, O. 17
Lansing Wheelbarrow Co., Lansing, Mich 19

Window Blinds—
Hartman & Durstine, Wooster, O. 13

Wire Goods—
*F. Powell & Co., Toledo, O. 24

Wire Machinery—
John Adt & Son, New Haven, Conn. 16

Wood-Working Machinery—
Frank & Co., Buffalo, N. Y. 19
Indiana Machine Work, Ft. Wayne, Ind 17
Egan & Co., Cincinnati, O. 14
G. H. Scanlan & Co., Portland, Me. 20

For Sale.

ONE OF DUNN'S HOISTING MACHINES, with over 40 feet of chain. Good as new; capacity, 600 lbs. Address Dunn, care Iron Trade Review, Cleveland, O.

FOR
ARTISTIC
PRINTING
WRITE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND, O.

Second-Hand Machinery.

Engines Complete.

150	H.-P.	Cutoff, side crank	$800
100	"	Cutoff, side crank	700
70	"	Plain, side crank	500
3 50	H.-P.	Plain, side crank, each	350
1 40	"	Plain, side crank	300
2 35	"	Plain, side crank	275
1 25	"	Plain, center crank	260
1 20	"	Plain, center crank	240
1 20	"	Plain, side crank	180
1 16	"	Plain, center crank	180
1 14	"	Plain, side crank	100
1 12	"	Plain, center crank	125
1 12	"	Plain, side crank	100
1 10	"	Plain, side crank	100
1 8	"	Vertical	75

Boilers Complete.

75	H.-P.	Tubular	$500
70	"	Portable	500
60	"	Tubular	400
50	"	5 flue	325
35	"	Portable	300
30	"	Portab'e	325
2 25	H.-P.	Portable, each	300
18	H.-P.	Portable	2.0
2 15	H.-P.	Portable, each	200
30	H.-P.	2-flue	190
25	"	2 flue	190
35	"	Vertical Tubular	250
15	"	Vertical Tubular	160
10	"	Single flue	100
8	"	Single flue	95
10	"	Tubular	140
8	"	Tubular	110
10	"	Portable	125
5	"	Vertical	65

Boilers and Engines Complete.

30	H.-P.	Portable detached,	$600
25	"	Portable, on wheels	500
25	"	Portable, on skids	475
25	"	Portable, detached	500
20	"	Portable, detached	450
16	"	Portable, on skids	400
16	"	Portable, detached	375
14	"	Portable, on wheels	300
12	"	Portable, on wheels	275
10	"	Portable, on wheels	250
8	"	Portable, on skids	160
10	"	Vertical Boiler and Engine	225
6	"	Vertical Boiler and Engine	160
4	"	Vertical Boiler and Engine,	115
8"		3-side moulder	100
26"		circular resaw	100
6-saw		gang lath mill	75
38"		Hall's patent shingle machine	150
Lime		extracting pan heater 60 H.-P.	75
Bolt		Cutter	40
Corn & Cobb		feed mill	25
30"		Bradford French burr mill	100
26"		double surfacer and matcher	400

Send for full particulars. All sizes and styles new boilers and engines. Send for new catalogue. Also particulars of second-hand rig wanted.

D. K. NORTON & SON,
CINCINNATI, O.

UNION
ELECTROTYPE
FOUNDRY
TELEPHONE 2139
829 SHERIFF ST. CLEVELAND, O.

CLEVELAND BUSINESS DIRECTORY.

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Coal, Iron and Ore.

PICKANDS, MATHER & CO., Iron Ore and Pig Iron, Cor. Bank and Superior Sts.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of casting. 9 Winter.

Hardware and Iron.

CLEVELAND ROLLING MILL CO., manufacturers of Steel and Iron Wire and Steel Tire.

Machinists' Supplies.

PARKIN & BOSWORTH, 9 and 11 So. Water St., dealers in Manufacturers' Supplies, Machinery and Tools.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils, Automatic Check Punches and Numbering Machines. 92 Seneca St.

BUSINESS DIRECTORY.

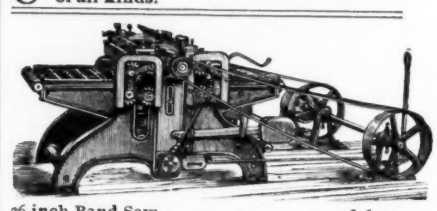
Akron, O.

MCNEIL, J. C. CO., Steam Boilers, Heavy Sheet Iron Work, &c. Repairing promptly executed.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main st.

Meadville, Pa.

CURRY & CO., general jobbers in Castings of all kinds.



26 inch Band Saw,	$ 65 00
30 inch Band Saw,	85 00
36 inch Band Saw,	105 00
Planer Planes 24x9,	120 00
Planer Planes 18x5½,	85 00
12 inch Buzz Planer,	85 00
Jig Saw, 6 saws,	65 00
Iron Saw Bench, 3 saws,	68 00

Other machines in proportion. All of our machines gauaranteed to give satisfaction. Send for circulars, special cash discounts, etc., before buying.

G. H SCANLAN & CO.,
96 & 98 Preble St., PORTLAND, Me.

M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treasurer.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

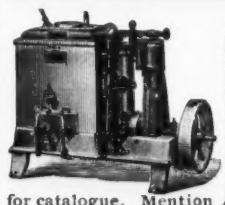
GEO. P. BURWELL, Gen'l Agt., 208 Superior St., Cleveland, O.

C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland, O.

A. D. BAITH, Special Agt., 208 Superior St., Cleveland, O.

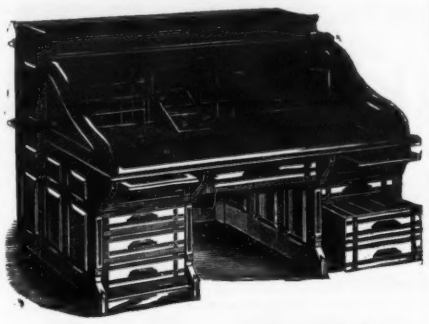
R. D. BRIGGS, Special Agt., 208 Superior St., Cleveland, O.

J. E. WOLCOTT, Special Agt., Akron, O.



Shipman Automatic Steam Engine: petroleum, kerosene or natural gas fuel. Automatic in fuel and water supply. Stationary and marine. 1, 2, 4, 6 and 8 horse-power single; 8, 12, 16 and 22 horse-power compound. No engineer. Send for catalogue. Mention *Iron Trade Review*. C. H. PRESLEY & CO., manufacturers' supplies, tools and machinery, 24 So. Water St., Cleveland, O.

AULT & WIBORG PRINTING INKS.
CINCINNATI.
A&W INK USED ON THIS PUBLICATION.



D. P. FISH,

Successors to BURGESS & FISH,

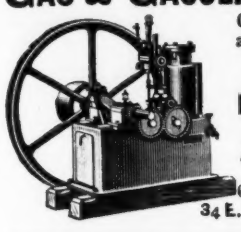
DESKS, CHAIRS, DOCUMENT FILES, LETTER FILES, OFFICE SPECIALTIES.

Repairing and Cleaning a Specialty.

213 Bank St., CLEVELAND, O.

TELEPHONE 2329.

VAN DUZEN GAS & GASOLINE ENGINE



OPERATED with COAL and OTHER MANUFACTURED GASES AND GASOLINE.

RELIABLE AND ECONOMICAL.

Fully Warranted

VAN DUZEN Gas & Gasoline Engine Co.
34 E. 2d St., Cincinnati, O.

Seeger & Guernsey's Cyclopædia of

THE MANUFACTURES AND PRODUCTS OF THE UNITED STATES,

comprises Every Article made in this Country—Indexed and Classified—and under each article the names and addresses of

THE BEST MANUFACTURERS.

Complete in One Royal Octavo Vol. of over 1000 pp.
Price in Cloth, $5. in Leather, $7.

INDISPENSABLE

to Buyers of Articles in all lines and Invaluable as a Statistical work.

• Orders received at office of this Paper •

Wheeling & Lake Erie Railway.

THE NEW THROUGH LINE

BETWEEN

TOLEDO

—AND—

Bowerston, Pittsburgh, Marietta.

THROUGH COACHES

BETWEEN

Toledo & Marietta.

Through Sleepers Between

PITTSBURGH AND CHICAGO.

AND DAY COACHES BETWEEN

Toledo and Pittsburgh, Via Akron, Cuyahoga Falls, Kent, Ravenna, Leavittsburg, Warren, Niles, Girard, Youngstown, New Castle and Allegheny.

The Only Line running through

"BEAUTIFUL ZOAR."

A. G. BLAIR, Traffic Manager. JAS. M. HALL, Gen'l Pass. Agent.

ECLIPSE AUST & CLARK PROPRIETORS

ELECTROTYPE AND ENGRAVING CO.

LITHOGRAPH BUILDING CLEVELAND

TRAVELERS' REGISTER.

Standard Time.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 45 a m	*6 25 p m
Marietta Express.....	†11 15 a m	†2 25 p m
Valley Junction Express...	*4 15 p m	*10 25 a m
Cleve. and Canton Express	*7 05 p m	†8 20 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	10 10 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 00 a m	5 40 p m
	3 25 p m	10 10 a m

d Daily. Other trains except Sunday.

Pullman Palace Sleeping Cars daily between Cleveland, Columbus and Cincinnati. City ticket office, Weddell House corner.

—THE—

Cleveland & Marietta Ry.

THROUGH TRAINS

BETWEEN

Toledo, Cleveland and the Ohio River.

The shortest and best Route via Marietta to

Washington, D. C., Charleston, W. Va., Parkersburg, W. Va., and the South.

Direct connections at Union Depots, with all great through lines to all Points

WEST, NORTHWEST, SOUTH, SOUTHWEST AND SOUTHEAST.

Lowest Rates. Quickest Time. Best Accommodations.

Tickets sold and baggage checked through to destination. Reliable information and best rates will be furnished by any agent of the Popular C. M.

A. T. WIKOFF, Pres. and Gen. Mgr. W. K. RICHARDS, G. P. & T. A.

THE FAVORITE

—AND—

PICTURESQUE ROUTE

—TO—

New York, Boston and the East.

The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the South east.

New Central Depot So. Water St. and Viaduct.

	Depart.
No. 62, Accommodation.....	† 6 05 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 45 p m
No. 73, Leavitssburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No. 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

A. M. TUCKER, Gen. Supt., Cleveland, O.

L. P. FARMER, Gen. Pass. Agt., New York
W. C. RINEARSON, Ass't G. P. A., Cleveland, O.
M. L. FOUTS, City Pass. and Ticket Agt., 141 Superior st., Weddell House, Cleveland, O.

FT. WAYNE, CINCINNATI & LOUISVILLE RAILROAD.

The Popular Route Between the

NORTH and SOUTH

The Direct Route to or from

Fort Wayne, Indianapolis, Terre Haute, Evansville and St. Louis.

13 MILES SHORTER BETWEEN **13**

Fort Wayne and Indianapolis,

Than any other Route.

22 MILES SHORTER AND QUICKER **22**

BY THREE HOURS, BETWEEN

Louisville and Fort Wayne.

ASK FOR TICKETS VIA

Ft. Wayne, Cincinnati & Louisville R. R.

For sale by all Agents of connecting lines, East, West, North and South.

GEO. W. SAUL, Gen'l Supt. W. H. FISHER, Gen'l Pass. & Tk. Agt.

FORT WAYNE, IND.

PITTSBURGH AND LAKE ERIE RAILROAD.

"Cleveland & Pittsburgh Short Line."

Twenty (20) Miles Shorter than any other route between Cleveland, Pittsburgh, Washington, Baltimore and the South East.

5 Through Trains Daily 5

FAST TIME. NO DELAYS.

"For scenery picturesque and varied,
Through valleys green, 'mong mountains ser-
The people's favorite route I ween, [ried,
The P. & L. E. sits enthroned as queen."

See that your tickets read via

THE PEOPLE'S FAVORITE ROUTE.

E. HOLBROOK, Gen'l Supt., A. E. CLARK, G. P. & T. A.
Pittsburgh, Pa.

SCIOTO VALLEY RAILWAY.

Direct route, Columbus, O., to Circleville, Chillicothe, Waverly, Portsmouth, Ironton and Ashland, Ky. Three trains daily except Sunday. Favorite route, North and West, making close connection at Ashland, Ky., with the Chesapeake & Ohio Ry., through the canons of New River, passing White Sulphur Springs and the many Summer resorts of the Alleghenies in Virginia.

Shortest and Quickest Route to Richmond, Lynchburg, Newport News, Old Point Comfort.

J. ROBINSON, Receiver, Columbus, O. JNO. J. ARCHER, Gen'l Pass. Agt.

To Those Looking

—FOR—

Manufacturing

SITES

IN THE SOUTH.

THE MOST DESIRABLE LOCATIONS IN THE SOUTH for manufacturing wagons, stoves, agricultural implements, furniture, or for foundries, machine shops, rolling mills, muck bar mills, nail works, glass works, cotton or woolen mills, and tanneries, are to be FOUND IN VIRGINIA along the line of the Norfolk & Western Railroad from Norfolk to Bristol and upon its branch lines. HARD WOOD OF EVERY VARIETY; PIG IRON from the furnaces at Lynchburg (2), Roanoke (2 in operation and 1 now under construction), Pulaski (1), Ivanhoe (1), Radford (1 to be built in 1890), Salem, Graham, Max Meadows and Bristol (1 at each point now under construction); bar iron from the rolling mills at Roanoke, Lynchburg and Richlands (1 to be built in 1890); COKE AND SEMI-BITUMINOUS COAL **from the Pocahontas Flat Top Field;** SUPERIOR GAS COALS from mines on the Clinch Valley extension; GLASS SAND from Tazewell Co.; COTTON FROM THE MARKETS of the Southern States, and Wool from all the Western and Southwestern States and Territories, at advantageous freight rates. FAVORABLE FREIGHT RATES made upon raw materials to all factories established upon its line, as well as to points in the United States and Territories, upon the manufactured articles.

Those seeking new fields for manufacturing establishments should not fail to investigate **the wonderful development of Iron, Coal and Coke Industries that has been made within the past five years along the line of the Norfolk & Western Railroad, and the advantages offered by the State of Virginia in the supply of cheap raw materials, by the Norfolk & Western Railroad** in the matter of freight facilities and rates upon raw materials and for reaching home, far distant and foreign markets, and by the cities and towns along its line in the way of advantageous sites, at moderate cost. Many of the cities and towns exempt manufacturing establishments from taxation for a series of years.

For further information as to freight rates and sources of supply of raw materials, apply to A. POPE, General Freight Agent, Roanoke, Va., or to

CHAS. G. EDDY.

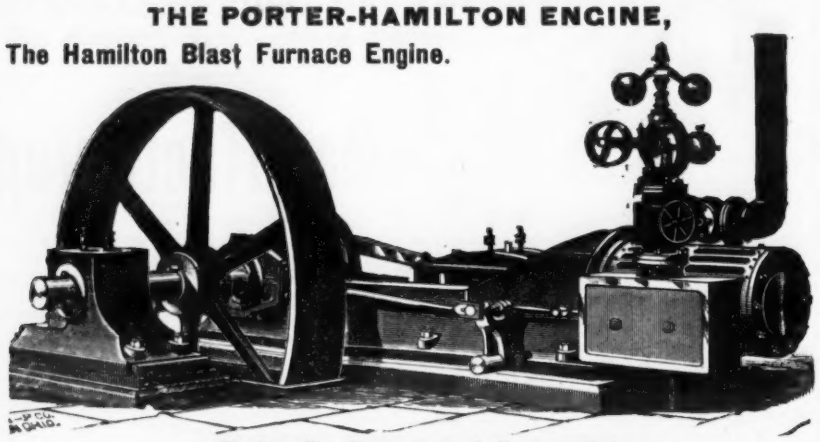
Vice-President,

ROANOKE, VA.

WILLIAM TOD & CO., Youngstown, O.

THE PORTER-HAMILTON ENGINE,

The Hamilton Blast Furnace Engine.



Hydraulic Cranes and Accumulators.

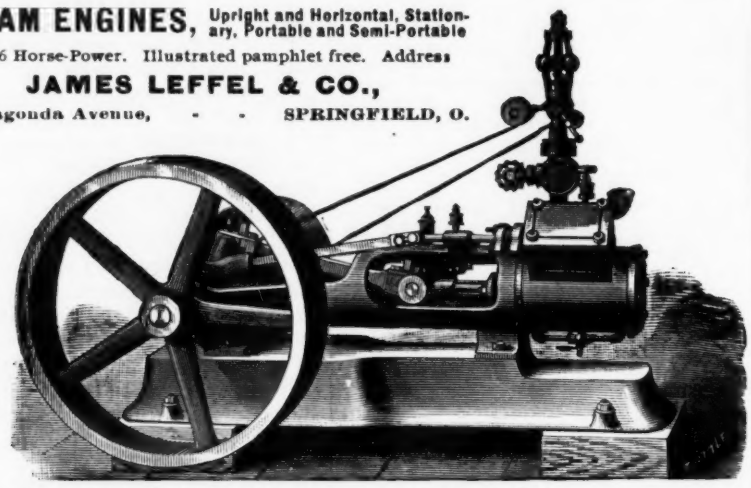
☞ Heavy special machinery generally. Send for illustrated catalogue.

STEAM ENGINES, Upright and Horizontal, Stationary, Portable and Semi-Portable

3 to 26 Horse-Power. Illustrated pamphlet free. Address

JAMES LEFFEL & CO.,

300 Lagonda Avenue, - - SPRINGFIELD, O.



For sale by C. H. PRESLEY & CO., 24 So. Water St., Cleveland, O.

FREIGHT AND PASSENGER

ELEVATORS.

L. S. GRAVES & SON,

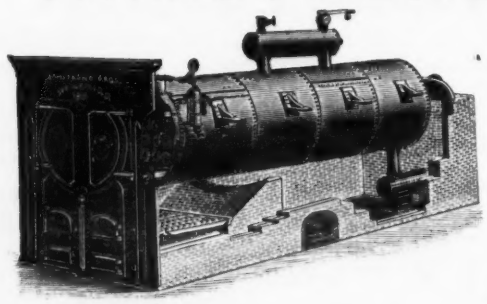
Main Office and Works, ROCHESTER, N. Y.

BRANCH OFFICES:

NEW YORK, 92 and 94 Liberty St.; BOSTON, 113 Devonshire St.; St. LOUIS, 301 Roe Building; DETROIT, Hodges Building.

SEND FOR CATALOGUE.

ARMSTRONG BROS.,



MANUFACTURERS OF

Engines AND Boilers

ALL SIZES AND KINDS.

Output Last Year 1473 Engines and Boilers.

Have large stock New Standard Boilers, and also large stock Second-hand Engines and Boilers, all sizes and kinds. Will dispose of at a bargain. For Circulars address

ARMSTRONG BROS., Springfield, O.

BARNES' PATENT

UPRIGHT DRILLS,

20 to 32 inch swing, with both worm and lever feed, self-feed and back-geared

Barnes' Patent Engine Lathe,

15 inch swing, 6 foot or 8 foot bed.

These machines are made a specialty in our factory. They have advantages not found in other machines in this line.

Barnes Water Emery Tool Grinder.

Has no Pumps.

No Valves.

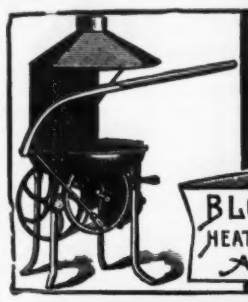
No piping to supply it with water.

It has nothing to get out of order; is always ready for use.

It is as easily managed as a grindstone, and will give vastly better results. It will be sold subject to approval.

It will pay parties desiring to purchase or know more about these machines to send for full description and prices to

W. F. & JOHN BARNES' CO., 827 Ruby St., Rockford, Ill.



Buffalo Forges

BLOWERS & EXHAUSTERS.
HEATING FURNACES, HAND BLOWERS.
AND BLACKSMITH DRILLS.

BUFFALO FORGE CO.
BUFFALO, N.Y.

SKINNER ENGINE CO., ERIE, PA.

OVER 3400 IN USE.

Manufacturers of **PORTABLE AND STATIONARY**

ENGINES AND BOILERS

SEND FOR CATALOGUE.

NEW YORK and NEW ENGLAND OFFICE:
C. R. VINCENT & CO., 15 Cortlandt St., N. Y.

BOILERS

MAHONING BOILER WORKS.

PIPES, STACKS, BEAMS, ROOF TANKS, BLAST FURNACES, ROLLING MILL WORK.

WM. B. POLLOCK & CO. YOUNGSTOWN, O.

THE ÆTNA MEDIUM & HIGH SPEED ENGINE

Manufactured by THE ÆTNA MACHINE CO. WARREN OHIO

150 to 2000 H.P. Latest Design.

FOR ROLLING MILLS AND ALL OTHER WORKS WHERE LARGE POWER AND CLOSE REGULATION IS REQUIRED

CONTRACTS MADE FOR COMPLETE STEAM PLANTS.
ENGINES ALWAYS IN STOCK.

"Treated" COTTON, Rubber Lined

Fire and Mill Hose.

Fabric Fire Hose Co.,

5 BARCLAY ST., NEW YORK, N. Y.

THE LAIDLAW & DUNN CO.

PUMPS OF EVERY DESCRIPTION. CINCINNATI, O. SEND FOR CIRCULAR.

HERCULES POWDER

SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE Known to the Arts.

POWDER, FUSE, CAPS, Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING

FOR SALE BY THE

HERCULES POWDER COMPANY,

40 Prospect Street, Cleveland, O.

E. W. WILLARD, Manager.

HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR

EASTLAKE METAL ROOFING,

W. J. BURTON & CO.,
Galvanized Iron Cornice Works. DETROIT, MICH

Soft Steel Plates and Sheets,

CORRUGATED ROOFING

Galvanized Iron. Patented Leveled Sheet.

THE STANDARD IRON COMPANY,

BRIDGEPORT, OHIO.

HOLTON ROOFING, SIDING, IRON ROOFING CEILING &c. CO.

NEW LISBON, O.
AGENTS WANTED EVERYWHERE

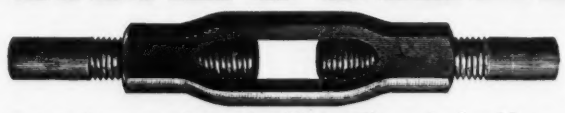
TARIFF vs. FREE TRADE

THERE are many arguments pro and con—each side seems to have convincing arguments, but when it comes to blacks for iron work of all kinds such as castings, agricultural implements, hollow-ware, and up to fine bicycle enamel, then the argument is all one way, everybody admits that Bonnell's Nubian Iron Enamels are the best on the market, and they are so positive that they guarantee absolute satisfaction, or will refund freight and all other charges which a trial has cost and take back goods. Write them.

The Nubian Iron Enamel Co.,

254 W. Jackson St., CHICAGO, ILL.

TURNBUCKLES.



Wrought iron open hexagonal turnbuckles. The only buckle made that has a perfect wrench hold.

Made from charcoal iron.

THE CENTRAL IRON & STEEL COMPANY,
BRAZIL IND.
Sole Manufacturer.

PRESSED WROUGHT IRON OPEN TURN BUCKLES.

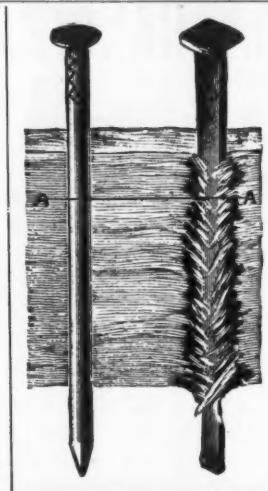
BEST AND CHEAPEST.

The list retail price of this Buckle is less than one-half the wholesale price of inferior goods when we commenced to manufacture, and dealers, even in small towns, find it profitable to carry a stock to sell with Iron for tie rods.

CLEVELAND CITY FORGE & IRON CO., CLEVELAND, OHIO.

ENGINEERING SPECIALTIES

REDUCING VALVES · PUMP PRESSURE REGULATORS · OIL PUMPS, VALVES, ETC ·
STANDARD REGULATOR CO BUFFALO, N.Y.



The SALEM WIRE NAIL CO.

MANUFACTURERS

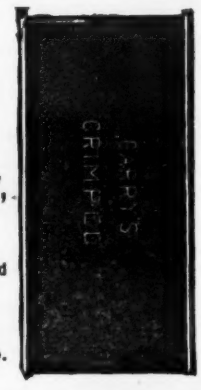
WIRE NAILS

Works: SALEM, O.; FINDLAY, O.

General Office: SALEM, O.

BRANCH OFFICES:

261 Broadway, New York. 209 Phenix Bldg., Chicago.
123 Soulard St., St. Louis. 4 Wiggins Bl'k, Cincinnati.



GARRY IRON AND STEEL ROOFING COMPANY,
The Largest Manufacturers of Iron and Steel Roofing in the World,
MANUFACTURERS OF ALL KINDS OF
Iron and Steel Roofing, Crimped and Corrugated Siding, Iron and Steel Tile or Shingle, Fire-Proof Doors and Shutters. Iron Ore Paint and Cement.
Iron Frames for Roofs and Buildings.
No. 152 MERWIN ST., CLEVELAND, O.
Send for circular and price list No. A

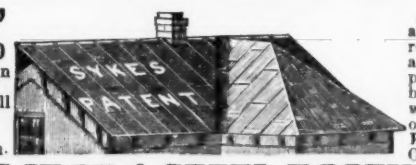
CORRUGATED IRON

Seven sizes of Corrugations---Straight or Curved. We want to mail you the Finest Roofing Catalogue ever published.

THOMPSON M'F'G CO., Cleveland, O.

CRIMPED

SYKES' IMPROVED
Best Roof in the World. Suitable for all classes of buildings. Easy put on.



All my Iron and Steel is re-rolled and box annealed, well painted on both sides with the Best of Paint and Pure Linseed Oil.

CORRUGATED

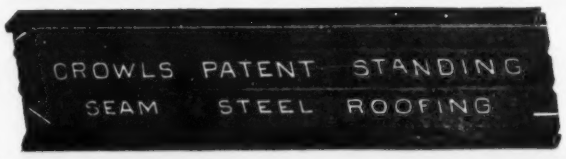
SYKES IRON & STEEL ROOFING CO.,
Send for Circular and Price List, and mention this paper. NILES, O., & KANSAS CITY, MO.

The BERGER MANUFACTURING COMPANY, CANTON, O.

DON'T make arrangements for ROOFING until you have seen ours.

It Excels all other Metal Roofs.

CAMBRIDGE ROOFING CO., Cambridge, O..



Manufacturers of
Plain, Rolled, Crimped Edge, Corrugated and Beaded Roofing, Siding and Ceiling.
PURE STEEL A SPECIALTY
Send for Descriptive Catalogue.

STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT.
True to pattern, sound, solid, free from blow-holes and of unequaled strength.
Stronger and more durable than iron forgings in any position, or for any service whatever.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.
Crossheads, Rockers, Piston-Heads, etc., for Locomotives. STEEL CASTINGS of every description.
Send for cirulars and prices to

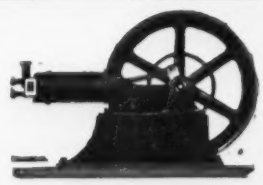
Chester Steel Castings Co.,
WORKS: CHESTER, PA. OFFICE 407 LIBRARY ST., PHILADELPHIA, PA.

Otto Gas Engine Works,

SCHLEICHER, SCHUMM & CO., Philadelphia. Chicago.

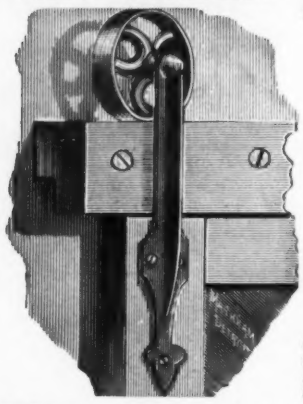
Horizontal OTTO Gas Engines.
Vertical OTTO Gas Engines.
Twin Cylinder OTTO Gas Engines.
Combined OTTO Gas Engine Pumps.
Combined OTTO Gas Engine Dynamos.

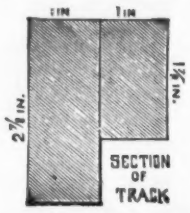
SIZES: 1, 2, 4, 7, 10, 15, 25 AND 50 HORSE-POWER.



THE KIDDER SLIDE DOOR HANGER.

PAT. APRIL 30, '78. REISSUED JULY 8, '79.





NO IRON RAIL.

Cannot be thrown off the track.

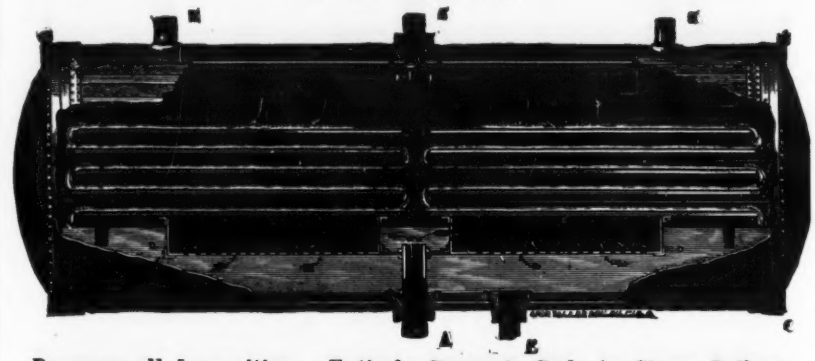
Can be put up in less time, runs with less noise and as easily as any other Hanger made. Ask your jobber for them, and if he cannot supply you, address

The Taylor & Boggis Fdy. Co.,

CLEVELAND, OHIO.

STILWELL'S PATENT LIVE STEAM-FEED WATER PURIFIER.

(HORIZONTAL STYLE.)



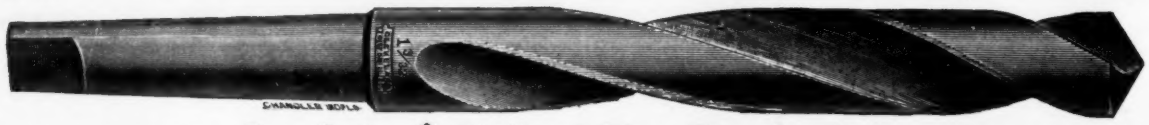
Removes all Impurities. Entirely Prevents Scale in Steam Boilers.

CATALOGUE ON PPLICATION.

STILWELL & BIERCE MANUFACTURING CO.

DAYTON, OHIO.

OLD 1874. # CLEVELAND TWIST DRILL CO., RELIABLE 1890.



SEND FOR CATALOGUE. **Cor. Lake & Kirtland Sts., Cleveland, O.** WRITE FOR DISCOUNTS.

The Hart or Detroit

Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,

Box 152, Chicago, Ill., or Box 84, Columbus, O.

☞N. B.—Also Agent for WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

☞ USE THE BEST. ☜

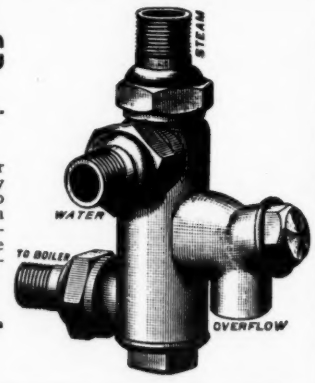
The PENBERTHY IMPROVED AUTOMATIC INJECTOR.

A Thoroughly Reliable and Simple Boiler Feeder for Stationary, Marine and Portable Boilers.

POINTS TO BE CONSIDERED.

They have only two VALVES to operate, only one after water valve is adjusted. They require no watching, as they RESTART AUTOMATICALLY if feed is broken. They lift 18 to 20 feet, and hot pipes don't affect them. They work from 25 to 135 and 160 lbs. pressure on water at natural temperature. The working parts are interchangeable and can be taken from Injector without any tools or breaking connections.

Send for circular, price list and discount.



PENBERTHY INJECTOR CO.

117 7th St., DETROIT, MICH.

C. H. PRESLEY & CO., Agents, Cleveland, O.

WE CARRY IN STOCK THE FOLLOWING

CHUCKS

Cushman's 4 Jaw Independent, 6″ to 26″.
Cushman's 3 and 4 Jaw Combination, 6″ to 18″.
Westcott's 3 and 4 Jaw Scroll Combination, 6″ to 24″
Whiton's 4 Jaw Independent, 4″ to 24″.
Horton's 3 and 4 Jaw Universal, 6″ to 24″.

Also a most complete line of Drill Chucks.

THE PARKIN & BOSWORTH CO., 9 and 11 South Water Street, CLEVELAND, O.

The BRISBEN SHELL CUTTER EMERY WHEEL DRESSER

We warrant greater service than any other Dresser in the market. For sale by the trade or direct from the manufacturer and patentee

Wm. W. Brisben,

Washington St.,

CLEVELAND, O., U. S. A.

REYNOLDS BROS.,

MANUFACTURERS OF

Hand Cut Files

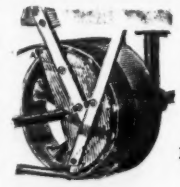
AND RASPS.

We solicit the commercial trade only.

133 & 135 N. Water St.,

COLUMBUS, OHIO.

Old Files Recut and Warranted Superior to any Machine Cut and Lead Tempered in the market. Send for price list.



WELLINGTON

Belt Holder.

Recent Improved.

BETTER THAN LOOSE PULLEYS.

Shifts Belt from Driving Pulley.

Belt stops when machine stops and lies slack until machine starts. Simple, cheap, easily operated. Sent on approval. Thousands in use. Address

W. R. SANTLEY & CO.,

Wellington, O.

THE WILMOT & HOBBS MFG. CO.,

BRIDGEPORT, CONN.

MANUFACTURERS OF

COLD ROLLED STRIP STEEL

SMOOTH SURFACE AND EVEN GAUGE.

ALSO

Plain and Lock Seamed

STEEL, BRASS and COPPER TUBING to ORDER.

Cold Rolled Strip Steel furnished in long coils or cut to lengths and sheared to exact widths when desired, in tempers adapted to requirements. Also C. R. Spring Steel.

Please mention this paper.

Awarded the GRAND PRIZE at the Paris Exhibition.

SEND FOR THIS BOOK
FREE ON APPLICATION.
THE BABCOCK & WILCOX CO
WATER TUBE
30 CORTLANDT ST. N.Y.
107 HOPE ST. GLASGOW, SCOTLAND.
BRANCH OFFICES
STEAM BOILERS
MANUFACTORIES IN UNITED STATES, SCOTLAND, FRANCE, GERMANY & AUSTRIA.

Pittsburgh Office: 408 Lewis Block.